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ABSTRACT

Data obtained from the 1975 Carnegie Survey of Teaching Faculty are used to investigate changes in tenure rate with a tenure rate estimation model used to examine the 1973 survey for the years that are covered by both surveys. There is a rapid fall in the medium time to tenure during the 1960's when there was the most rapid increase in enrollments. Quantitatively, however, the medium times to tenure estimated from the 1975 data are lower than those estimated from the 1973 data for the earlier years (1950-1968). The appendix contains the complete tabulation of results from the 1975 survey. (Author/SPG)

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Market Conditions and Tenure for PH.D.'s in U.S. Higher Education

A Report for
the Carnegie Council
on Policy Studies
in Higher Education

Results from the 1975
Carnegie Faculty Survey and a Comparison
with Results from the 1973 ACE Survey

Charlotte V. Kuh

Project on Quantitative Policy Analysis Models
of Demand and Supply in Higher Education

Technical Report No. 3

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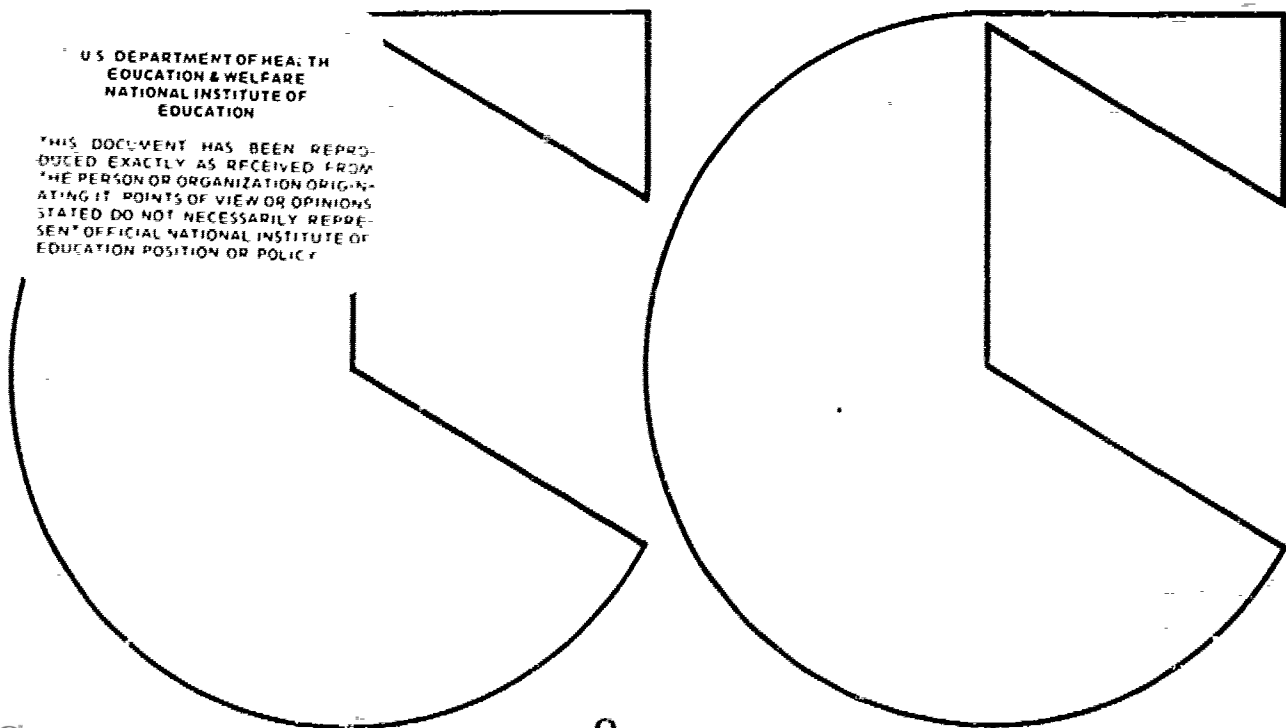
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MARKET CONDITIONS AND TENURE FOR PH.D.'S IN U.S.
HIGHER EDUCATION: RESULTS FROM THE 1975 CARNEGIE FACULTY
SURVEY AND A COMPARISON WITH RESULTS FROM THE 1973 ACE SURVEY

Charlotte V. Kuh

Technical Report No. 3

July, 1977

Carnegie Council on Policy Studies
in Higher Education

Project on Quantitative Policy Analysis Models
of Demand and Supply in Higher Education

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Introduction and Summary

This technical report describes the results of the tenure rate estimation model that was discussed in Kuh and Radner (2), using data obtained from the 1975 Survey of Teaching Faculty sponsored by the Carnegie Council on Policy Studies in Higher Education. Qualitatively, the results are similar to those found using data from the 1973 ACE Survey for the years that are covered by both surveys. There is a rapid fall in the median time to tenure during the 1960's when there was the most rapid increase in enrollments. Quantitatively, however, the median times to tenure estimated from the 1975 data are lower than those estimated from the 1973 data for the earlier years (1950-1968).

In the section below, we shall first summarize the results from the 1975 data. We shall then discuss the differences between the results of the estimation using the 1973 and 1975 surveys and what could have given rise to these differences.

To summarize the most important specific results:

1. For all types and control of institution, median times to tenure fell rapidly from 1961 until the late 1960's. Thereafter, they rose slowly through 1973, for universities and private colleges, and levelled off for public colleges. Generally, the median time to tenure is longer in private than in public institutions. This same pattern is found in broad fields. We also find that the median time to tenure is longer in the physical and biological sciences than in the humanities and social sciences.

2. We investigated possible explanations for the lower median times to tenure for earlier years that were estimated for the 1975 Survey. Although the main differences between the two samples were the smaller size of the 1975 Survey and the inclusion in it of relatively more low quality

institutions, these differences do not appear to explain the systematic differences in the estimates from the two samples. Rather, it appears that the differences result from systematic differences of the incidence of tenure for the older cohorts. At any age, the older cohorts in the 1975 sample are more likely to be tenured than the older cohorts in the 1973 sample. We think that this may be due to selective attrition of untenured older faculty. Careful examination of this hypothesis, however, must wait until we have investigated data from the NAS-NRC comprehensive roster to obtain direct evidence of movements into and out of academia.

Results from the 1975 Survey

The estimated age and date effects are presented in Tables 1 and 2 of the Appendix. These were estimated by the method described in Kuh and Radner [2]. Our statistical model estimates the tenure rate, which we define as the chance that a nontenured faculty member will be granted tenure in any given year. The tenure rate is dependent upon conditions specific to that year (which we call a "date effect") and on the time that has elapsed since the faculty member obtained the Ph.D. degree (which we call an "age effect"). These age and date effects are more easily interpreted when they are combined in the calculation of a "date-corrected" median time to tenure. This is calculated by taking the age effects and, for each year, applying the appropriate date effect. The corresponding probability frequency distribution is then found and the median of the corresponding cumulative distribution is the date-corrected median time to tenure. The date corrected median for year t can be interpreted as the median time to tenure that would be experienced by the cohort that entered academia in year t if conditions did not change thereafter.

Table 1 presents the median times to tenure that would occur if date had no effect. These medians along with the interquartile range, allow us to contrast differences in time to tenure for different types of institutions. The median time to tenure is a year longer in private institutions than in public institutions. The dispersion is least in public universities and greatest in private universities.

TABLE 1

Median and Interquartile Ranges of Time to Tenure
Uncorrected for Date Effects

	<u>Median</u>	<u>Interquartile Range</u>
Public Universities	5.6	4.5
Private Universities	6.6	5.3
Public Four Year	5.1	5.1
Private Four Year	6.1	5.1

In Table 2, we allow the date effects to vary and present the date-corrected median times to tenure. These medians give us a picture of how date effects change the time to tenure while the distribution of age effects is unchanged. These median times to tenure are plotted against date in Figure 1 for universities and Figure 2 for four year institutions. For universities, the median time to tenure is almost always longer in private than in public institutions. The median times to tenure estimated from the 1975 Survey are more variable than those estimated from the larger 1973 sample. For universities, they fall rapidly for the years from 1961 to 1965 and reach a minimum in 1968. After 1968, they rise fairly steadily to 1974.

The median times to tenure are quite similar for public and private four year institutions until after 1968, when the median time to tenure for private colleges rises, while for public colleges, it continues to fall. The median time to tenure begins to fall in 1961 for private colleges and in 1962 for public colleges. As was the case for universities, there is considerable variability in the estimated median times to tenure;

TABLE 2

MEDIAN AGES TO TENURE
1975 SURVEY

DATE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1950	6.150	6.505	4.505	5.608
1951	6.871	6.717	9.724	8.121
1952	6.200	6.341	7.709	7.680
1953	6.079	6.544	8.995	7.450
1954	6.386	7.977	7.006	8.141
1955	7.005	6.317	6.144	6.591
1956	6.047	7.234	6.470	6.836
1957	6.169	7.13	5.892	5.991
1958	5.294	7.13	6.464	6.721
1959	6.392	8.007	6.828	7.589
1960	6.187	5.509	6.040	5.977
1961	6.664	7.427	6.850	8.216
1962	5.910	6.308	8.383	7.145
1963	5.743	5.382	6.289	6.668
1964	5.430	5.928	5.553	5.536
1965	4.639	5.944	6.607	5.473
1966	5.925	5.856	5.495	5.422
1967	5.015	5.737	5.026	5.358
1968	4.602	5.514	5.151	4.895
1969	4.828	5.821	4.590	5.089
1970	4.837	6.051	4.200	5.609
1971	5.011	5.900	4.106	6.130
1972	4.850	6.236	4.055	5.584
1973	5.143	7.303	4.164	5.874
1974	5.088	6.284	3.705	5.122
MED	5.66745	6.55992	5.05702	5.11490
IQR	4.46982	5.28504	5.12576	5.15203
RATIO	0.78858	0.80556	1.01359	0.84254

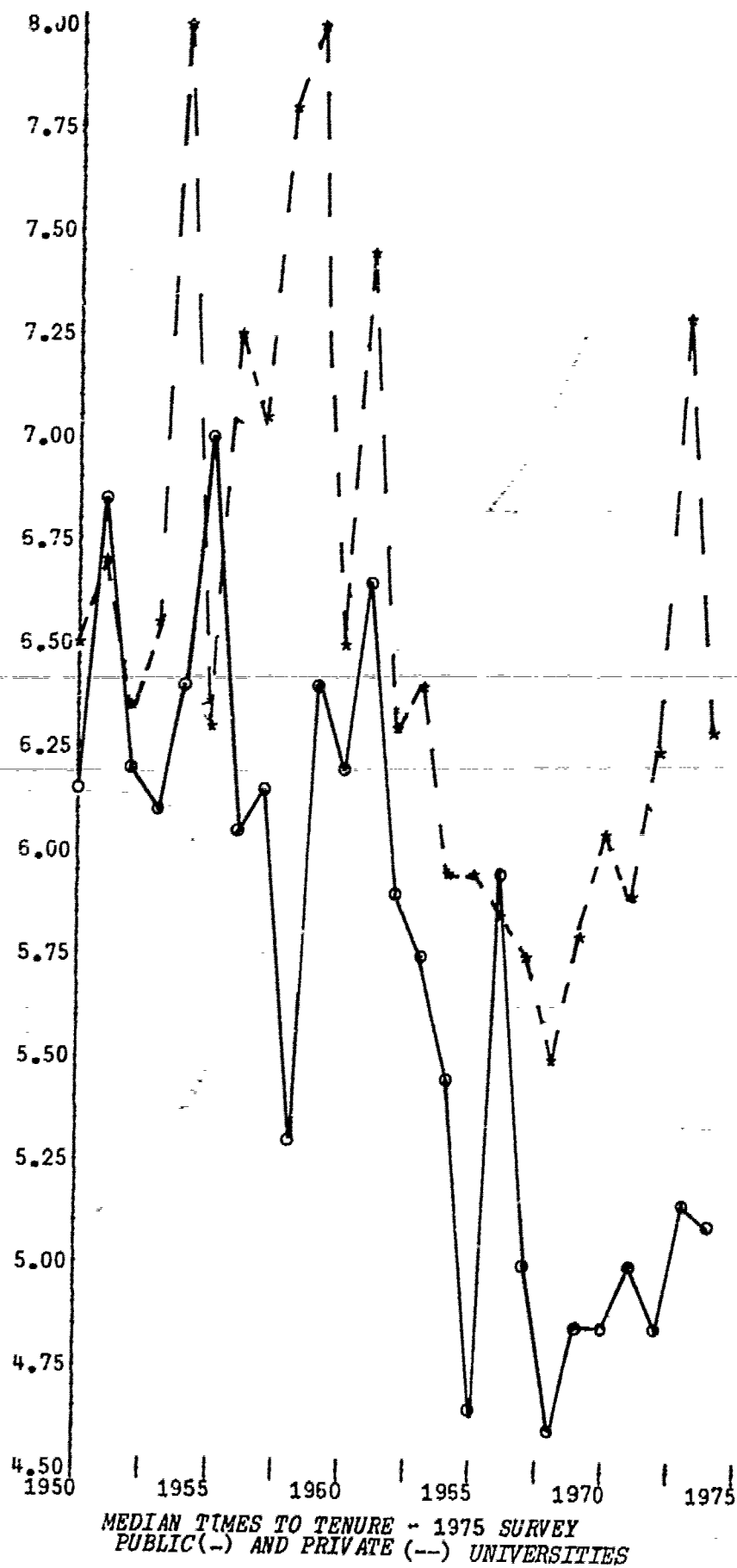
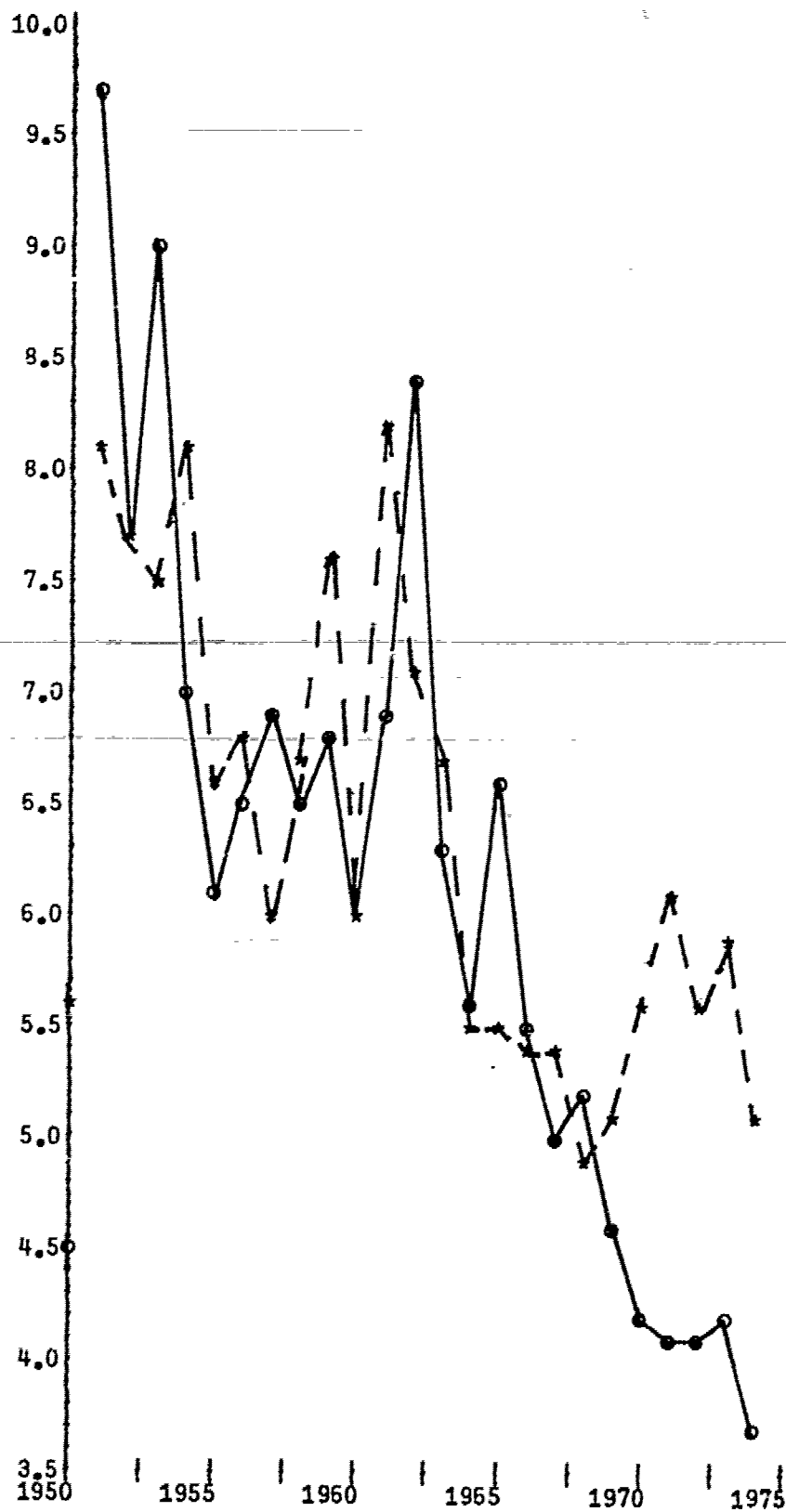


FIGURE 1



MEDIAN TIMES TO TENURE - 1975 SURVEY
PUBLIC 4 YR (-) AND PRIVATE 4 YR (--) COLLEGES

FIGURE 2

however, the declining trend is clear after 1962 for both types of college and, for public colleges, appears to level off beginning in 1970. For private colleges, the median time to tenure increases markedly from 1969 to 1972, but declines again after 1972.

The median times to tenure for broad fields are shown in Table 3 for public universities and Table 4 for private universities. Age and date effects for fields were not estimated for four year institutions because of the small sample size. The age and date effects, raw age- and date-specific promotion rates and cohort sizes are given by field for universities in the Appendix.

Due to the fairly small sample size, there is considerable variability from year to year in the estimates. However, the trend perceived in the overall university estimates is reflected in the individual fields. The time to tenure fell from 1961 or 1962 until the late 1960's. The trend is less marked, however, than was the trend in the 1973 sample. For all fields, the median times to tenure are usually lower in public than in private universities. For almost all public university fields, the median time to tenure begins gradually to rise in the 1970's. For private universities in physical, biological and social sciences there is a spike in the median time to tenure in 1973. This corresponds to a very low date-specific promotion rate in these fields. The cause of this result is still a mystery to us, however, and the gradual upward trend continues in 1974 if we ignore the spike. Graphs of the estimated median times to tenure plotted against time are shown in Figure 3 for the physical sciences and in Figure 4 for the social sciences.

For the period from 1960 on, the humanities, social sciences and engineering have the lowest median times to tenure. Biological and physical

TABLE 3

MEDIAN AGES TO TENURE
1975 SURVEY/ PUBLIC UNIVERSITIES

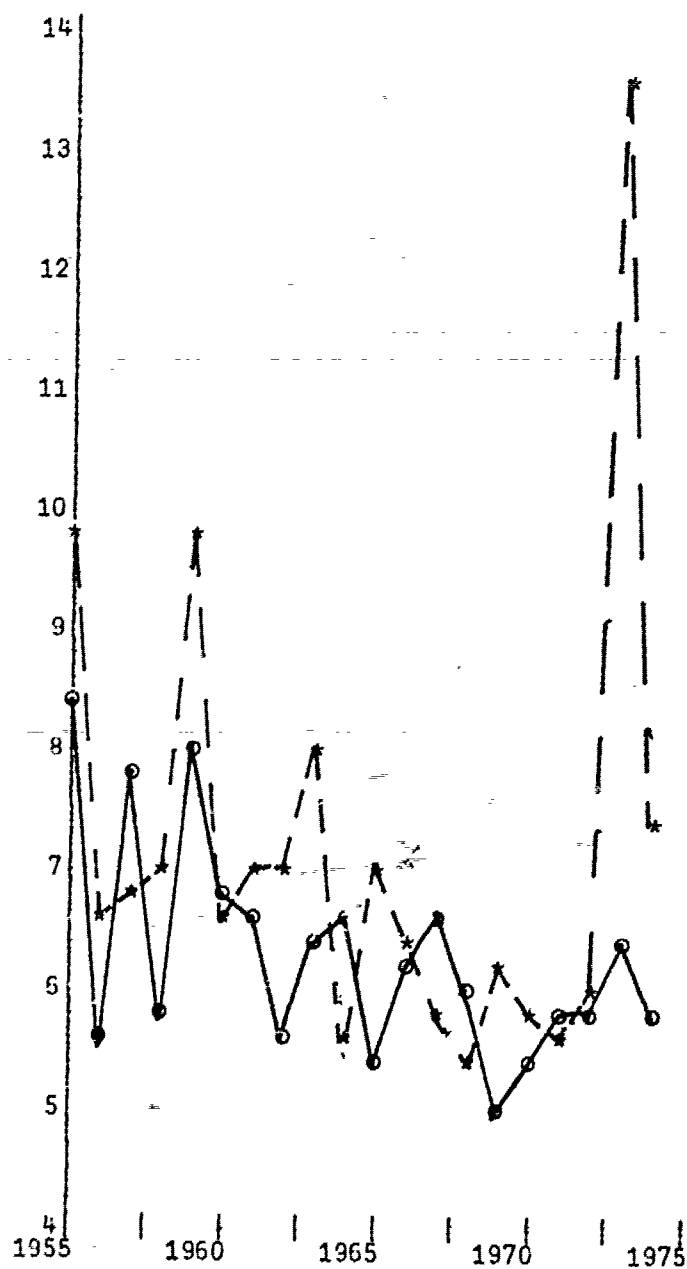
DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1950	6.707	4.614	5.873	5.971		
1951	8.643		21.149	5.846		
1952	7.448	6.344	5.655	6.471	5.856	
1953	5.182		5.997	6.337	6.377	3.651
1954	7.628		5.523	5.783	4.737	7.164
1955	9.372	7.388	5.281	8.422	4.815	4.678
1956	10.360	5.349	5.953	5.575	7.942	5.334
1957	7.284	5.161	5.257	7.745	6.636	4.436
1958	6.459	3.976	5.702	5.731	4.315	11.050
1959	6.877	5.077	5.236	7.901	5.044	4.535
1960	7.477	5.619	5.365	6.729	5.576	3.678
1961	6.564	4.918	6.302	6.521	6.004	
1962	7.661	4.916	5.382	5.663	7.486	4.396
1963	5.245	10.330	5.408	6.321	5.025	11.529
1964	11.577	3.959	5.564	6.524	4.798	5.683
1965	5.853	3.714	4.127	5.426	4.811	4.024
1966	8.266	4.943	5.386	6.216	4.338	3.546
1967	5.333	4.359	4.789	6.622	5.064	3.948
1968	5.606	3.420	4.374	5.051	4.217	3.891
1969	5.467	4.132	3.924	4.977	4.103	3.674
1970	5.323	4.088	4.269	5.343	5.858	4.235
1971	7.403	4.269	4.362	5.753	4.829	3.862
1972	5.758	4.831	4.476	5.823	3.939	4.173
1973	5.662	4.236	4.878	6.444	4.238	4.375
1974	5.884	4.594	5.188	5.723	5.303	5.455
					4.455	4.754
MED	5.700	4.560	5.264	6.186	4.975	4.456
IQR	4.993	3.663	3.479	3.630	3.519	3.548
RATIO	0.745	0.803	0.661	0.587	0.707	0.796

TABLE 4

MEDIAN AGES TO TENURE
1975 SURVEY/PRIVATE UNIVERSITIES

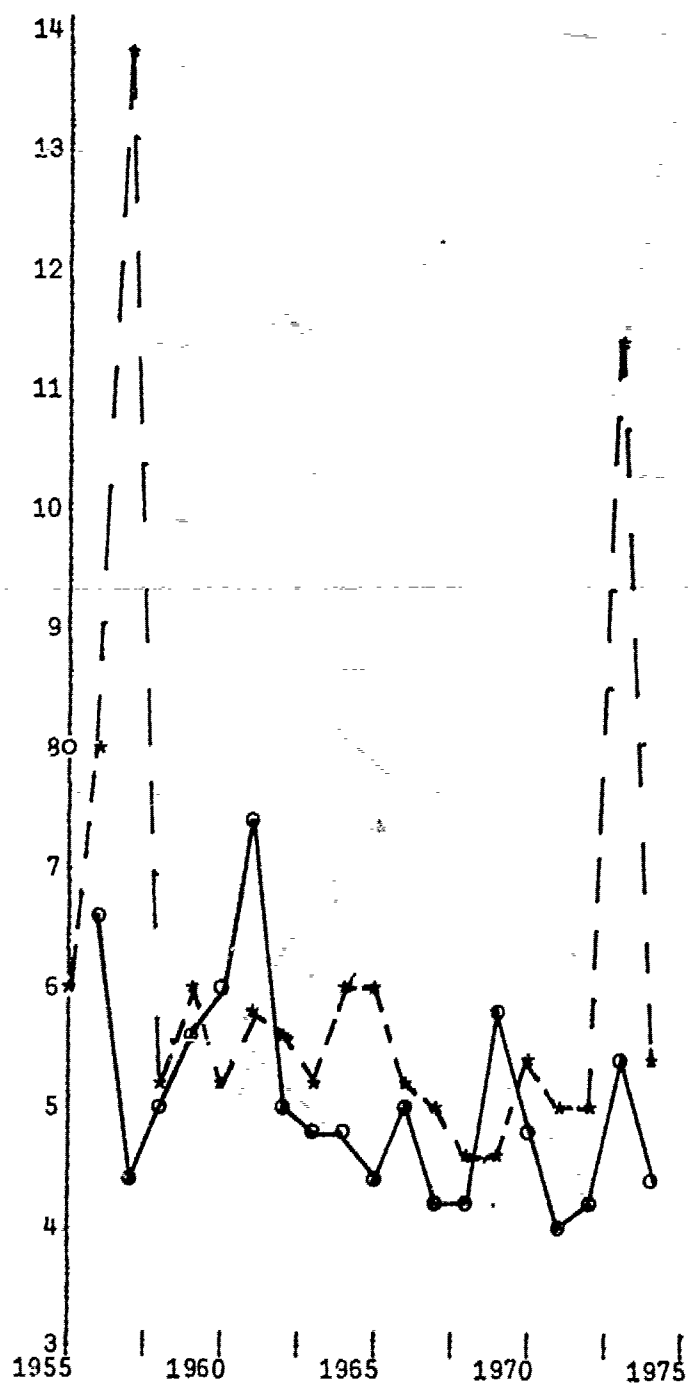
DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1950		4.576	6.298	7.792	4.600	
1951		4.417	7.251	5.782	3.851	5.531
1952	7.296	6.331	5.118	8.470	6.542	4.955
1953	5.707	4.110	7.877	7.699	8.270	3.599
1954			5.862	7.769	5.495	6.284
1955	7.010	8.937	5.302	9.708	6.016	6.842
1956	10.293	9.558	5.773	6.579	7.950	5.382
1957	6.318	11.399	5.648	6.704	13.820	5.605
1958	6.964	9.000	8.449	5.901	5.146	6.970
1959	9.495	6.902	5.927	9.722	6.053	6.936
1960	7.286	9.860	5.562	5.650	5.231	6.808
1961	7.235	9.551	6.417	6.946	5.813	
1962	6.026	8.915	5.575	6.919	5.692	4.034
1963	9.321	6.766	4.767	8.066	5.111	
1964	6.444	6.692	5.285	5.577	5.957	3.871
1965	6.265	7.253	4.263	6.948	6.021	4.680
1966	6.144	5.579	5.121	6.398	5.252	6.837
1967	7.275	5.757	4.116	5.820	5.057	6.195
1968	9.321	5.235	3.794	5.430	4.624	7.860
1969	7.050	4.759	4.710	6.119	4.637	4.547
1970	7.109	5.497	4.931	5.702	5.371	7.877
1971	6.256	8.620	4.764	5.700	5.006	6.471
1972	6.997	5.610	5.923	5.994	4.975	6.115
1973	12.196	5.761	5.424	13.527	11.496	6.140
1974	7.260	5.007	6.213	7.307	5.445	4.799
MED	7.474	6.414	5.588	6.845	5.574	6.111
IQR	6.240	4.785	4.220	4.675	3.663	5.212
RATIO	0.835	0.746	0.755	0.683	0.657	0.853

sciences take longer. The median times to tenure for physical sciences and for humanities are graphed in Figure 5 for public universities and Figure 6 for private universities. For almost all years, the median time to tenure is shorter for the humanities for both types of institutions. In Kuh and Radner [2] we speculated that this somewhat surprising result, which was also found in the estimates from the 1973 data, might be due to post-doctoral fellowships in the sciences delaying entry into tenure track positions and thus delaying the time to tenure. We have found that this, in fact, appears to be the case. These results will be discussed in a subsequent Technical Report. In both humanities and physical sciences, however, the trend of declining times to tenure in the early 1960's and increasing times to tenure after 1968 is clearly evident.



MEDIAN TIMES TO TENURE - PHYSICAL SCIENCES
PUBLIC (-) AND PRIVATE (---) UNIVERSITIES

FIGURE 3



MEDIAN TIMES TO TENURE - SOCIAL SCIENCES
PUBLIC (—) AND PRIVATE (---) UNIVERSITIES

FIGURE 4

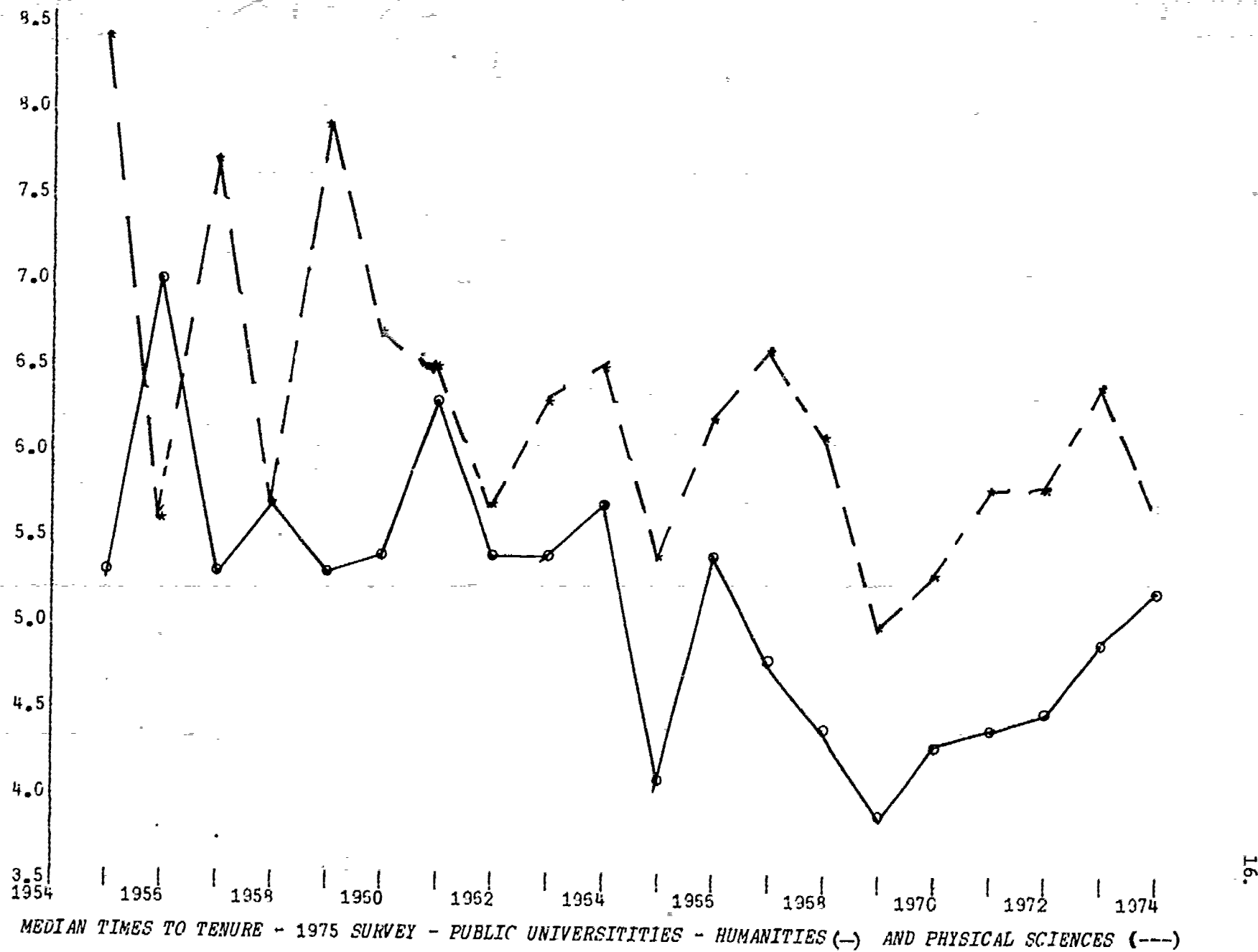
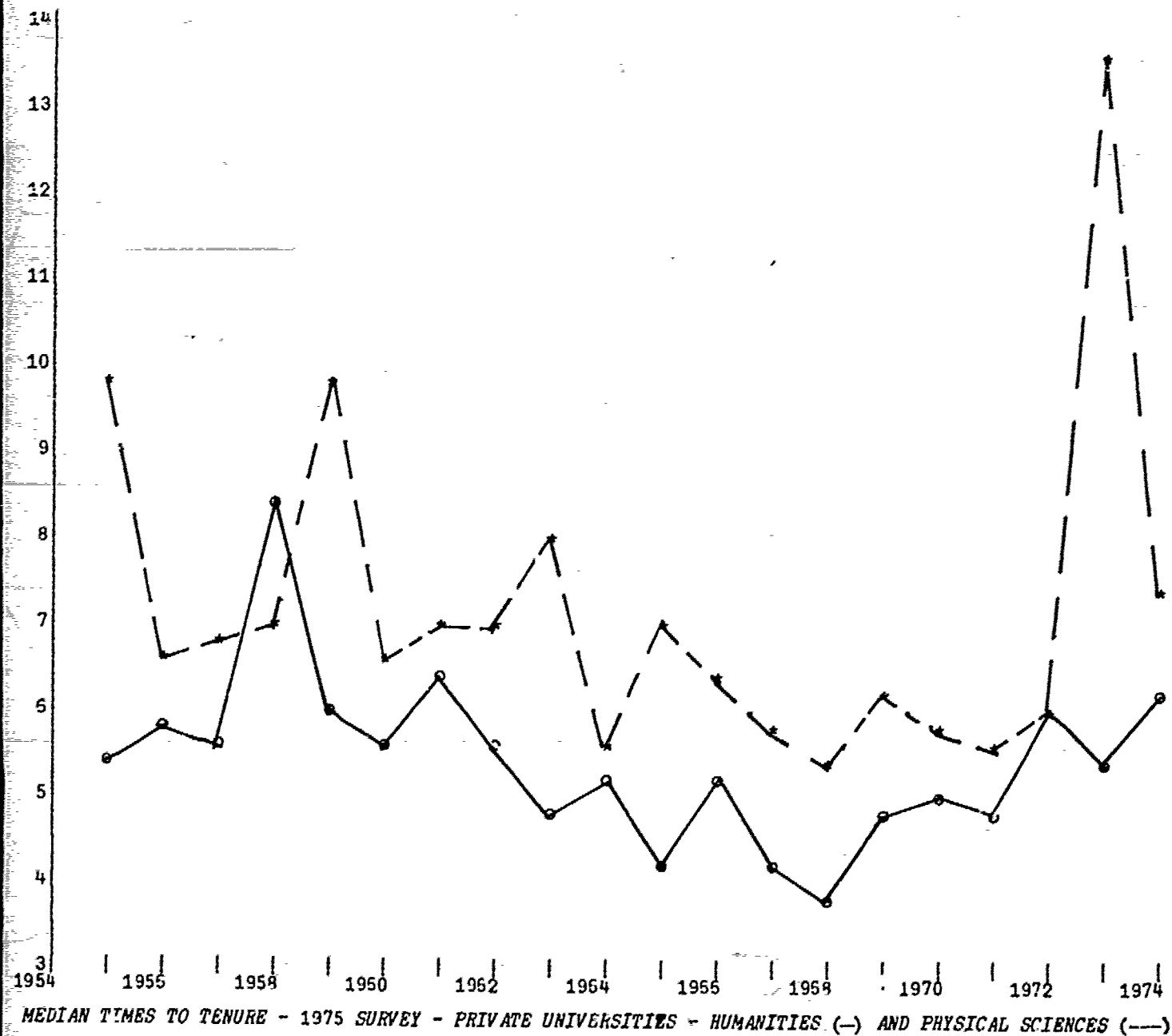


FIGURE 5



17.

FIGURE 6

Differences in the Results from the 1973 and 1975 Surveys

Qualitatively, for the years which both surveys have in common, the results from the two surveys are quite similar. Quantitatively, however, the results are not. The percentage differences in the median times to tenure are shown in Table 5, and an example of a plot of the different estimates for public universities is shown in Figure 7. Although for both samples the minimum is reached in the same year and the decline occurs over the same period, the estimates from the 1975 survey are more variable and are lower than those from the 1973 survey until 1968. The magnitude of the discrepancy in earlier years is often as great as 25-35% (and occasionally much larger for public four year colleges).

It is important to isolate the source of these differences, particularly if we are interested in the using the date effects as measures of market adjustment in order to predict adjustment of tenure to future changes in market conditions. Thus, it is worthwhile to examine fairly closely differences in the data in the two samples. Sample choice and sampling technique are discussed at length in Bayer [1] for the 1973 survey and in Trow's 1975 technical report [3]. We will not review that material except to note that the sample size in 1975 was considerably smaller than in 1973 and that there was less oversampling of high quality institutions in 1975 than in 1973.¹

Let us first look at the raw numbers. Since the sub-sample that we studied contained only full-time Ph.D.'s, the data that appear below will be different from that appearing either in Bayer [1] or in Trow [3].

^{1/} Although we discuss here the 1973 Survey, it used the same sample as the 1969 Carnegie Survey, so that remarks made concerning 1973 are applicable to 1969 as well.

TABLE 5

*MEDIAN AGES TO TENURE
PERCENT CHANGE FROM 1973 TO 1975 SAMPLES*

<i>DATE</i>	<i>PUBLIC UNIVERSITIES</i>	<i>PRIVATE UNIVERSITIES</i>	<i>PUBLIC COLLEGES</i>	<i>PRIVATE COLLEGES</i>
1950	-28.358	-35.055	-64.968	-35.248
1951	-12.010	-36.019	-21.898	-25.246
1952	-17.967	-35.840	-53.185	-0.894
1953	-26.609	-34.385	-41.373	-22.731
1954	-18.545	-10.429	-63.864	-10.399
1955	-17.282	-35.029	-59.625	-35.119
1956	-22.945	-23.055	-50.009	-27.525
1957	-24.077	-25.758	-40.890	-35.802
1958	-33.417	-23.582	-39.331	-24.820
1959	-20.254	-11.803	-56.584	-13.231
1960	-19.535	-23.041	-33.507	-18.753
1961	-15.340	-16.165	-32.988	-9.592
1962	-22.149	-21.311	-5.827	-9.654
1963	-17.259	-18.725	-34.024	-10.543
1964	-19.458	-21.051	-20.804	-32.554
1965	-27.350	-14.359	-0.586	-13.055
1966	-0.760	-16.164	-4.648	-20.726
1967	-8.258	-12.359	-14.014	-3.501
1968	9.280	1.460	16.490	-4.787
1969	4.201	4.725	18.308	-14.206
1970	8.019	-5.156	15.889	2.155
1971	8.177	2.958	3.582	3.333
1972	6.981	4.980	13.619	4.624

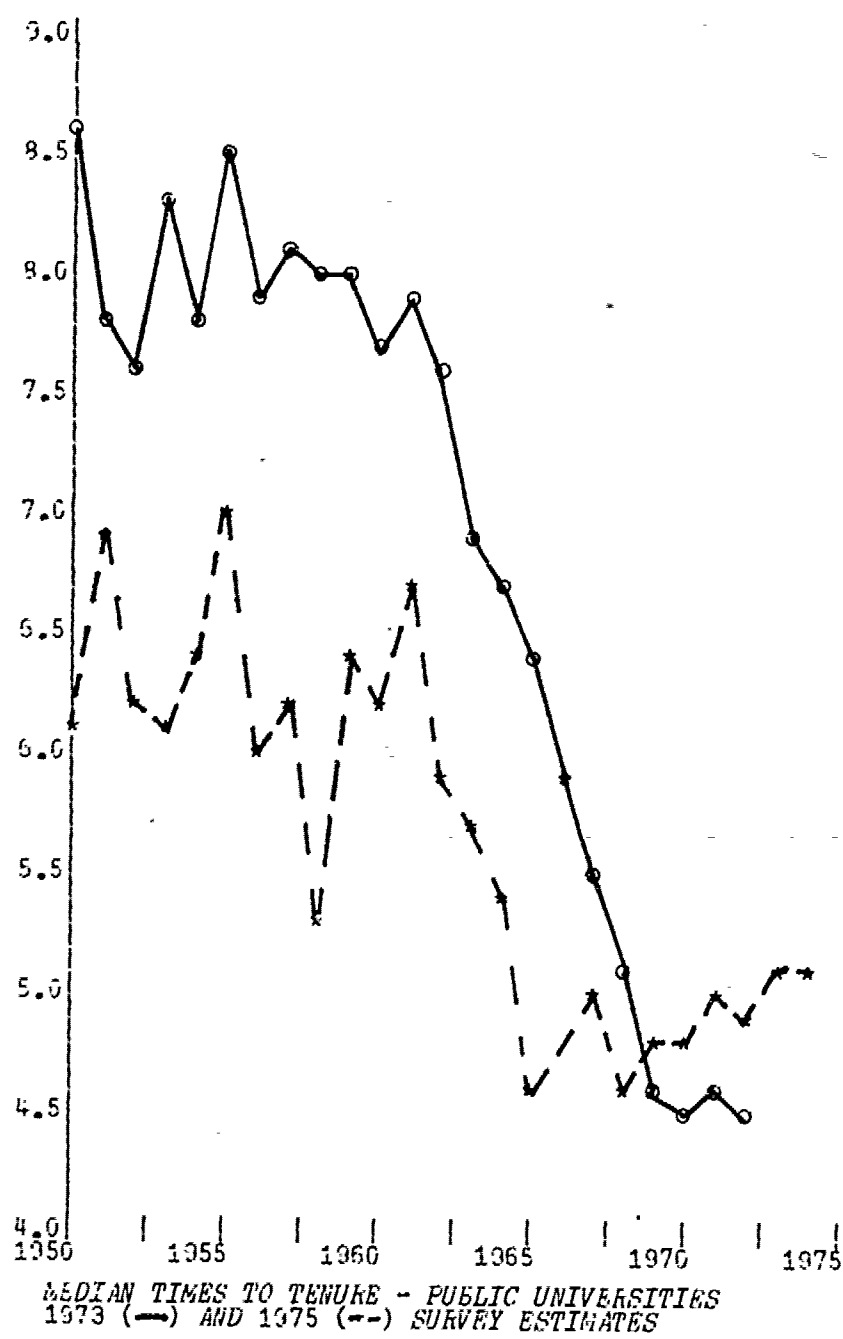


FIGURE 7

As mentioned earlier, the 1975 survey was considerably smaller than the earlier one. The largest decline was in the numbers of individuals sampled from public universities, where over three times as many individuals were surveyed in 1973. The sizes of the different samples are given in Table 6.

TABLE 6

Sample Sizes by Type of Institution:
1973 ACE Survey and 1975 Carnegie Survey

Year of Sample	Type of Institution			
	Public University	Private University	Public 4 Year	Private 4 Year
1973	14255	4748	1960	3058
1975	4226	2445	2070	2059
Difference	10029	2303	-110	999

The differences in sample size are likely to make the estimates from the 1975 Survey more variable. However, the estimates from the two samples differ more systematically than could simply be accounted for by greater variability. In early years, for all types of institutions, the medians estimated from the 1975 Survey are always below those estimated from 1973.

We then compared the age-related and date-related promotion rates in the two samples. These are shown in Tables 7 and 8. For all types of institutions, a greater proportion of faculty in the 1975 sample were promoted at earlier ages, while more faculty in the 1973 sample who were still in academia and untenured were promoted at later ages in the 1973 Survey. In the 1975 Survey, there were no faculty left who were non-tenured at these late ages.

The differences in the date-related promotion rates show that those

TABLE 7

RAW AGE-RELATED PROMOTION RATES
PERCENT CHANGE FROM 1973 TO 1975 SAMPLES

AGE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1	20.137	22.800	48.854	62.494
2	11.248	57.149	5.432	11.152
3	10.091	22.549	20.192	39.177
4	39.306	29.509	44.379	1.028
5	27.440	20.652	66.398	45.155
6	57.348	69.000	41.484	47.506
7	31.570	21.508	36.159	52.851
8	59.985	31.989	25.075	32.467
9	30.514	38.460	35.052	58.203
10	37.577	55.079	53.717	47.298
11	45.710	15.799	38.342	20.541
12	22.377	15.952	36.154	25.197
13	3.761	14.653	10.516	17.547
14	14.158	3.593	77.887	22.185
15	-3.973	126.467	12.241	19.097
16	-0.266	39.944	5.285	27.941
17	133.170	145.000	15.667	74.747
18	44.303	-10.366	8.497	14.773
19	10.367	35.238	242.222	13.675
20	-48.883	3.768	34.000	3.677
21	35.419	43.182	150.000	73.504
22	47.321	53.571	40.000	32.913
23	7.273	117.308	34.921	96.667
24	100.000	55.459	14.286	100.000
25	22.920	100.000	55.556	44.444
26	78.195	-22.619	242.857	142.857
27	100.000	13.333	100.000	58.462
28	100.000	526.667	50.000	100.000
29	37.958	300.000	30.000	263.536
30	11.429	100.000	225.000	37.500

TABLE 8

RAW DATE-RELATED PROMOTION RATES
PERCENT CHANGE FROM 1973 TO 1975 SAMPLES

DATE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1950	56.240	97.426	273.585	133.043
1951	1.370	86.277	1.429	-19.935
1952	23.675	93.347	120.220	16.411
1953	58.163	75.468	66.023	-17.778
1954	31.601	8.152	196.954	18.480
1955	26.884	107.168	271.250	54.263
1956	58.648	40.402	112.104	37.222
1957	60.328	58.505	90.487	87.879
1958	122.551	55.944	88.833	32.522
1959	39.728	10.507	166.541	3.774
1960	35.102	49.193	59.559	-31.559
1961	18.520	17.300	43.695	10.905
1962	42.445	40.605	9.649	0.731
1963	29.943	30.610	47.573	4.824
1964	40.396	41.869	-24.313	90.453
1965	-76.081	15.757	10.891	18.475
1966	18.226	20.865	1.715	41.209
1967	7.206	-12.421	-15.869	0.789
1968	-15.535	-10.390	-32.354	5.950
1969	-16.073	-23.340	-31.437	-27.757
1970	-21.747	23.102	-30.728	-13.237
1971	-25.104	-9.846	-16.351	-16.610
1972	24.954	30.483	33.369	19.473

in the 1975 Survey had greater promotion rates for almost all years and all types of institution up until 1969. It is also true that, as might be expected, a greater proportion of those in the 1975 Survey had received their Ph.D.'s after 1969 than had those in the 1973 Survey. The differences in distribution of the two samples by cohort are shown in Table 9 and the proportion tenured in 1973 and 1975 by cohort are shown in Table 10. The two distributions are different in systematic ways. There is a smaller proportion of the 1975 Survey in the earlier cohorts, although for early cohorts these differences are quite small (4.2% more of the 1973 Survey are in the pre-1950 cohorts than in the 1975 Survey for public universities). However, this discrepancy in the samples is greatest for the middle cohorts, who were tenurable at dates when tenure rates were increasing rapidly. It is also clear that for any pre-1970 cohort, tenure rates were higher in the 1973 than in the 1975 Survey. This is due in part to the longer "exposure" to tenure for each cohort. However, even the pre-1960 cohorts which, in 1973, had been tenurable for at least 13 years, have higher tenure ratios.

We have seen that, descriptively, there are differences between the two surveys that could result in the systematic differences we observe in the estimates. We must now ask whether these differences are the result of sampling differences or whether, in fact, there is a difference in the characteristics of the underlying population that is being sampled.

Aside from the smaller size of the 1975 Survey, the main difference that we find from reading Trow's 1975 technical report [3] is that it samples more institutions of lower quality were sampled in 1975. If tenure behavior varied systematically by quality, then we could expect differences in our estimates (that is, a "quality" effect). We divided the sample into three different quality classifications for each type of institution and

TABLE 9

COHORT DISTRIBUTION IN PERCENTAGES
ABSOLUTE DIFFERENCES BETWEEN 1975 AND 1973 SAMPLES

DATE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1925				
1926				
1927				
1928		-0.001		
1929				
1930				-0.001
1931	-0.001		-0.001	
1932		-0.002	-0.001	-0.001
1933		0.002	-0.001	-0.001
1934			0.002	-0.001
1935	-0.002	-0.002		-0.002
1936	0.002		-0.001	-0.001
1937			-0.001	-0.001
1938	-0.002	-0.001	-0.001	-0.002
1939	-0.001	0.003	-0.002	-0.002
1940	-0.002	-0.002	0.002	-0.004
1941	0.003	-0.003	0.004	-0.002
1942	-0.001	-0.002	-0.006	-0.004
1943	-0.006	-0.005	-0.001	-0.005
1944	-0.004	-0.004	-0.002	-0.002
1945	0.003	0.003	-0.001	0.004
1946		0.001	0.005	-0.002
1947	0.002	-0.002	-0.001	-0.003
1948	-0.001	0.004	-0.002	-0.005
1949	0.001	0.003	0.003	0.008
1950	-0.001	-0.002	-0.001	-0.003
1951	-0.002	0.005	-0.004	-0.007
1952	-0.002	-0.001	-0.005	-0.007
1953	-0.005	0.011	0.011	-0.007
1954	-0.006	-0.002	-0.005	-0.005
1955	-0.007	-0.008	-0.007	-0.007
1956	-0.009	-0.005	-0.014	-0.010
1957	-0.005	-0.006	-0.014	-0.005
1958	-0.002	-0.003	-0.011	-0.002
1959	0.007	0.010	0.014	-0.002
1960	-0.002	-0.007	-0.006	-0.008
1961	-0.004	-0.006	-0.008	0.007
1962	-0.003	0.010	-0.003	
1963	-0.002		-0.001	-0.004
1964	-0.005	-0.007	-0.012	-0.008
1965	-0.004	-0.002	-0.018	-0.002
1966	-0.003	-0.008	-0.002	-0.003
1967	-0.010	0.018	-0.010	0.003
1968	-0.007	-0.006	0.004	
1969	0.004	0.009	0.016	-0.004
1970	0.003	0.006	0.019	0.011
1971	0.010	0.009	0.002	
1972	0.019	0.022	0.028	0.009
1973	0.027	0.032	0.028	0.032

TABLE 10

Percentage tenured in 1973 by Cohort and
Cohort Distribution of the Sample

A. Percentage Tenured

<u>Year of Ph.D.</u>	<u>Public University</u>			<u>Private University</u>		
	<u>1973</u>	<u>1975</u>	<u>Difference</u>	<u>1973</u>	<u>1975</u>	<u>Difference</u>
1950 or before	97.9	98.3	0.4	96.1	98.1	2.0
1960 or before	96.5	98.2	1.7	95.6	97.1	1.5
1965 or before	93.4	97.0	3.6	90.1	94.1	4.0
1970 or before	77.9	85.8	7.9	72.2	78.8	6.6
Entire Sample	73.6	70.3	-3.3	68.7	63.9	-4.8

B. Sample Distribution

1950 or before	15.1	10.9	-4.2	17.2	12.6	-4.6
1960 or before	42.6	33.1	-9.5	46.1	36.8	-9.3
1965 or before	65.5	52.4	-13.1	67.6	54.9	-12.7
1970 or before	94.2	79.6	-14.6	91.9	80.0	-11.9

A. Percentage Tenured

	<u>Public 4-Year</u>			<u>Private 4-Year</u>		
	<u>1973</u>	<u>1975</u>	<u>Difference</u>	<u>1973</u>	<u>1975</u>	<u>Difference</u>
1950 or before	94.0	98.1	4.1	92.7	96.9	4.2
1960 or before	94.6	97.6	2.0	91.4	95.5	4.1
1965 or before	92.9	96.1	3.2	88.0	92.5	4.5
1970 or before	77.3	85.2	7.9	69.4	80.4	11.0
Entire Sample	71.9	67.3	-4.6	63.2	61.1	-2.1

B. Sample Distribution

1950 or before	8.5	5.1	-3.4	14.3	7.9	-6.4
1960 or before	35.0	21.8	-13.2	41.6	28.1	-13.5
1965 or before	57.3	37.9	-19.4	61.1	44.9	-16.2
1970 or before	91.7	72.8	-18.9	90.4	71.7	-18.7

re-estimated age and date effects for each sub-sample. A plot of the resulting median ages by quality of institution for public universities is shown in Figure 8. It appears that high and low quality institutions both have lower median times to tenure than medium quality institutions. Thus, if there were more medium quality institutions in the 1973 sample, the higher median time to tenure that we observe might result from this difference. Since it would be a major undertaking to reclassify the individuals in the 1973 Survey by quality of institution, we tried, in order to get a "feel" for the magnitude of the quality effect, to weight the 1975 data by the 1973 quality weights.^{2/} For public universities, the plots of the median times to tenure estimated from the weighted and from the unweighted 1975 data are shown in Figure 9. The estimated median time to tenure from the 1973 data and from the weighted 1975 data are shown in Figure 10. Although the estimates are very similar after 1965, the differences in the earlier years remain. Similar results were found for the other types of institutions. From these results, we concluded that differences in the distribution by quality of the institutions in the two samples would probably not account for much of the difference in the estimates of median times to tenure from the two samples.

Another possibility that we must consider has to do with the different wording of the tenure question on the two questionnaires. The 1973 Survey asks when the respondent received tenure at his current institution. The 1975 Survey asks when the respondent first ob-

^{2/} This reweighting is very approximate, because the ACE's "selectivity" coding is based on average National Merit Scholarship qualifying test scores of entering freshman, while the Trow quality classification is based on the Gourman rating. However, both classifications are broad enough that the number of institutions that would be classified one way by Trow and another way by the ACE should be small.

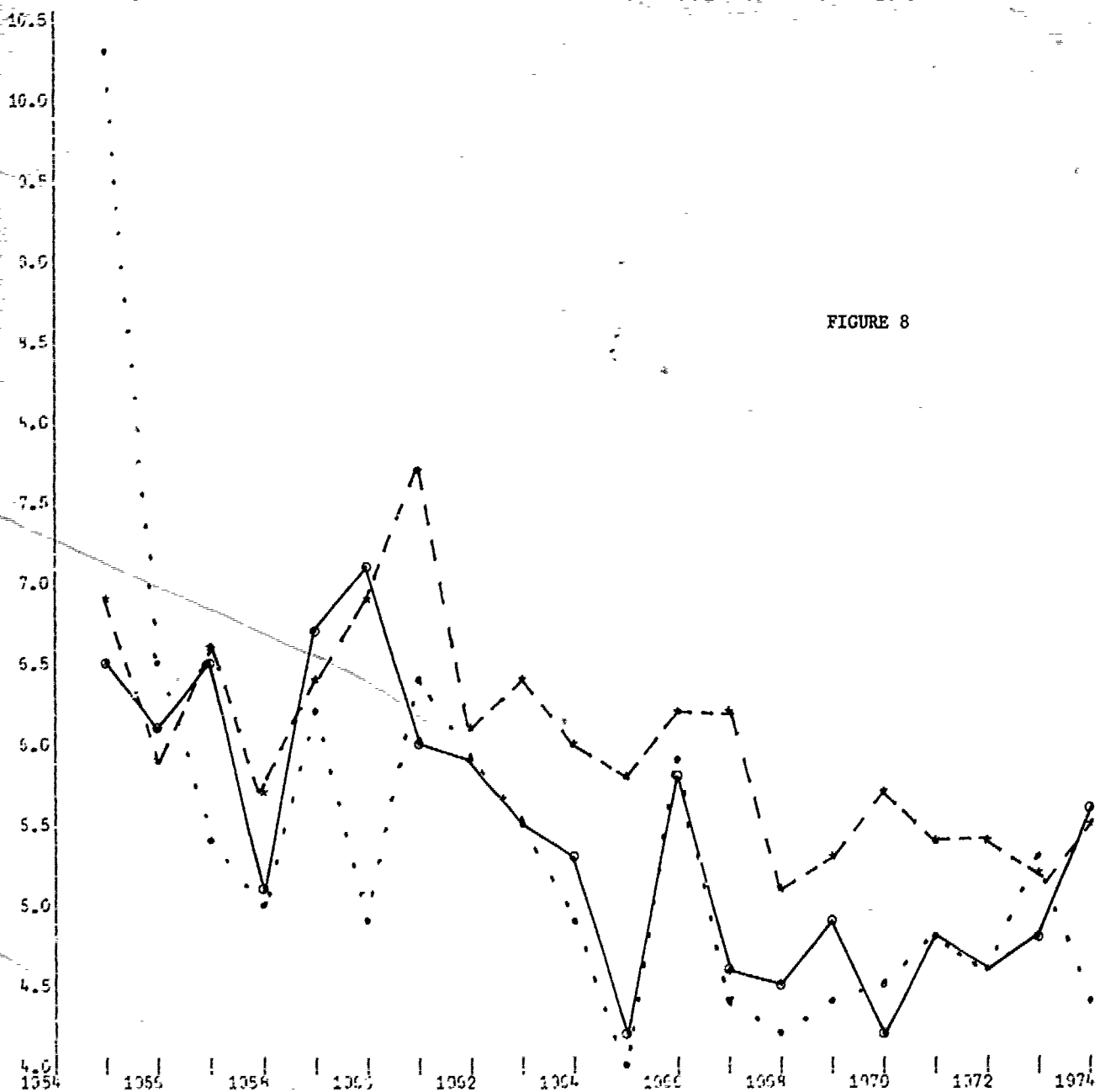
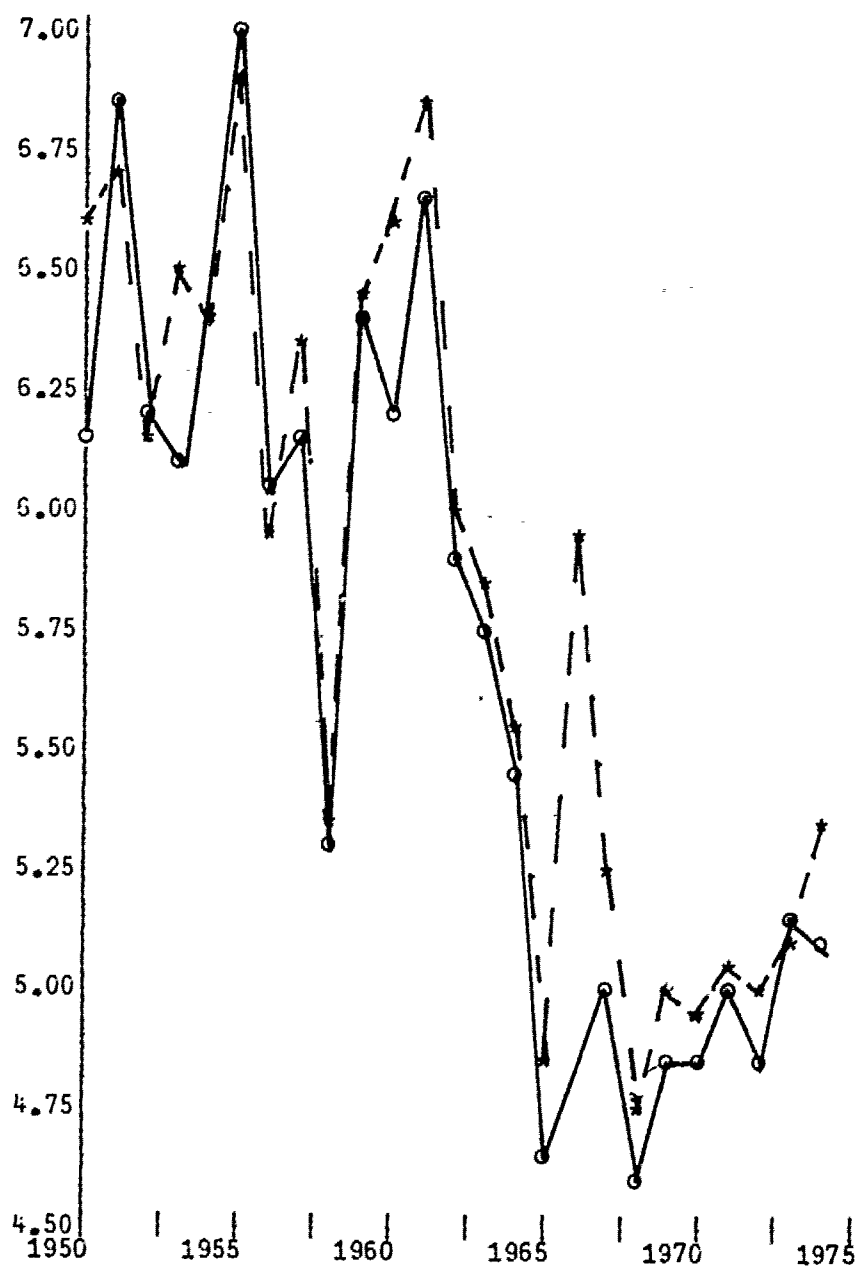


FIGURE 8

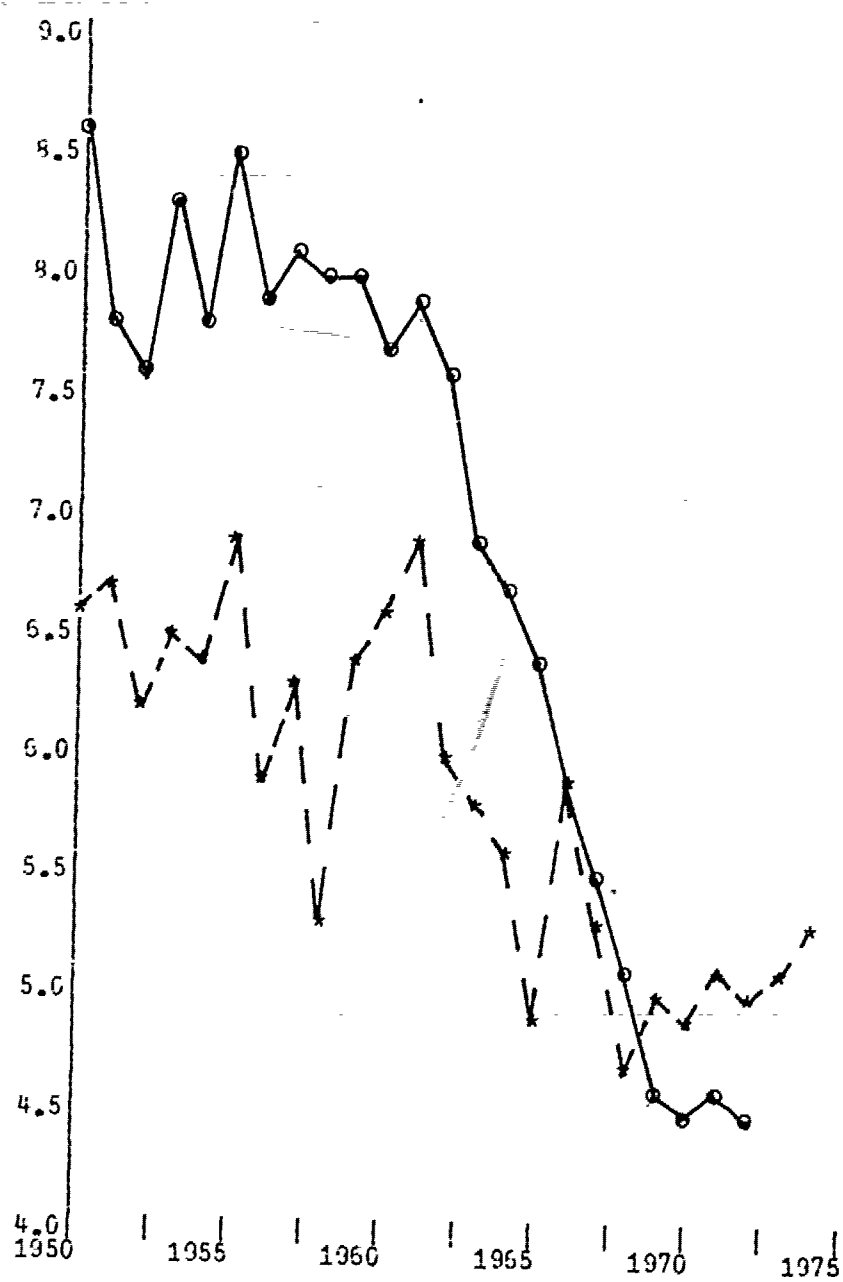
MEDIAN TIMES TO DEGREE BY QUALITY - PUBLIC UNIVERSITIES - 1975 SURVEY
 HIGH (—) MEDIUM (---) AND LOW (···) QUALITY UNIVERSITIES

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MEDIAN TIMES TO TENURE - PUBLIC UNIVERSITIES
UNWEIGHTED (—) AND WEIGHTED (---) ESTIMATES

FIGURE 9



MEDIAN TIMES TO TENURE - PUBLIC UNIVERSITIES
1973 SURVEY (o) AND WEIGHTED 1975 (*)

FIGURE 10

tained tenure. It is quite obvious, however, that most respondents to the 1973 Survey read the question as asking when they first received tenure, since, for public universities for example, over 80% of the respondents with tenure report receiving tenure before the date at which they began continuous service at their current institution. We also know the date the respondent first became tenured if he received tenure after moving to his current institution. The only questionable group are those who reported receiving tenure at the same date as they began service at their current institution. This group is a very small proportion of those in four year institutions. However, it forms 14% and 15% of the tenured sample in public and private universities, respectively. Unfortunately this group contains two parts: those who first received tenure when they moved to their current institution and those who already had tenure when they moved.

We have not been able to figure out a way to estimate the "true" date of first receiving tenure for this group. However, we can obtain bounds of the effect on our estimates. The median times to tenure reported above and in Kuh and Radner [2] are estimated on the assumption that all of the group for which the date of receiving tenure (T) was the same as the date of beginning service at their current institution (C), received tenure for the first time (T^*) on that date. This then provides an upper bound on the estimate of time to tenure, since some of the people in this group may have received tenure earlier (i.e., $T^* < T$), and so their "true" median time to tenure would be lower. A lower bound can be found by simply eliminating the questionable group from the sample and reestimating the median times to tenure. These results are shown in Figure 11 for public universities and in Figure 12 for

FIGURE 11

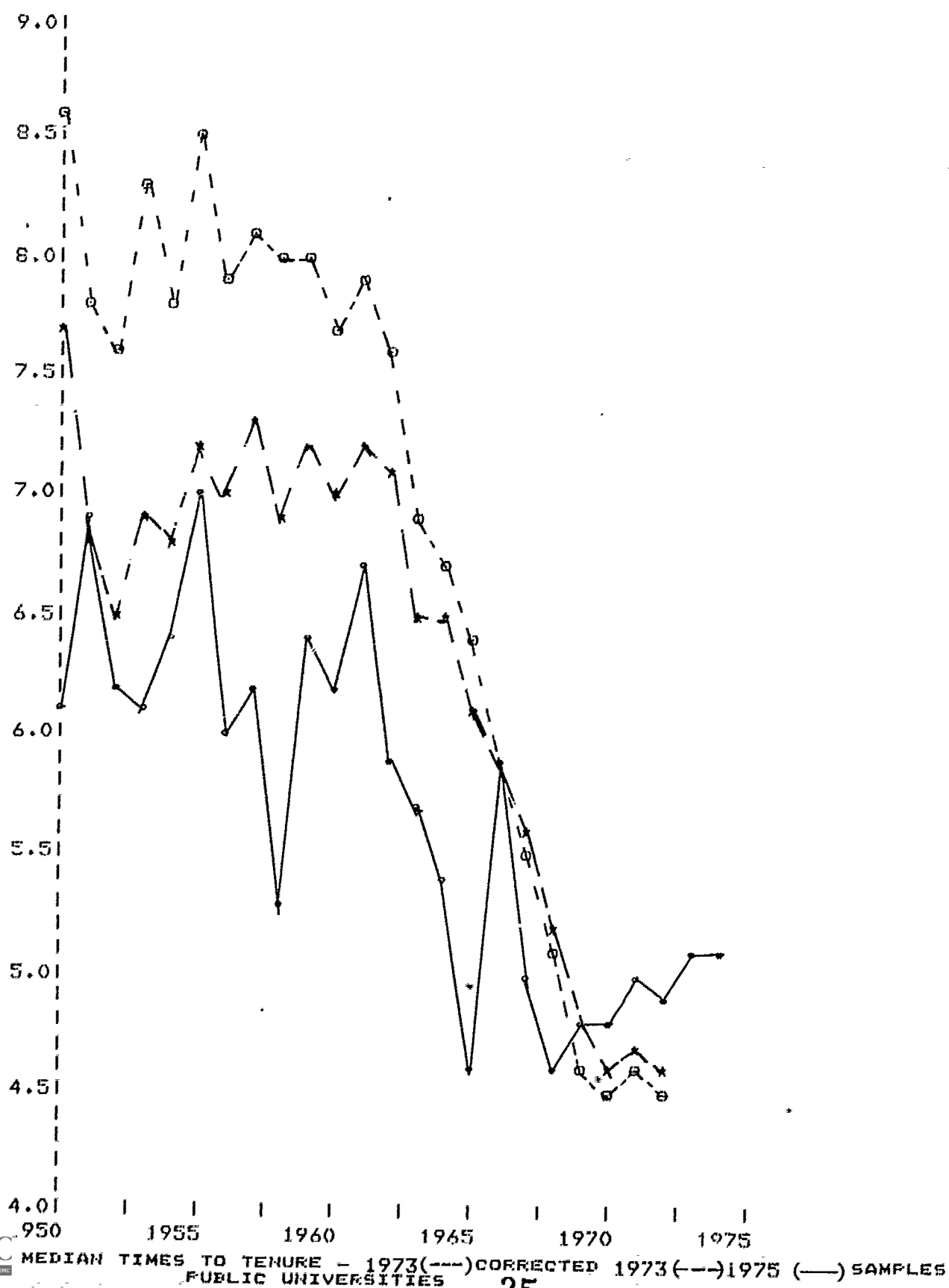
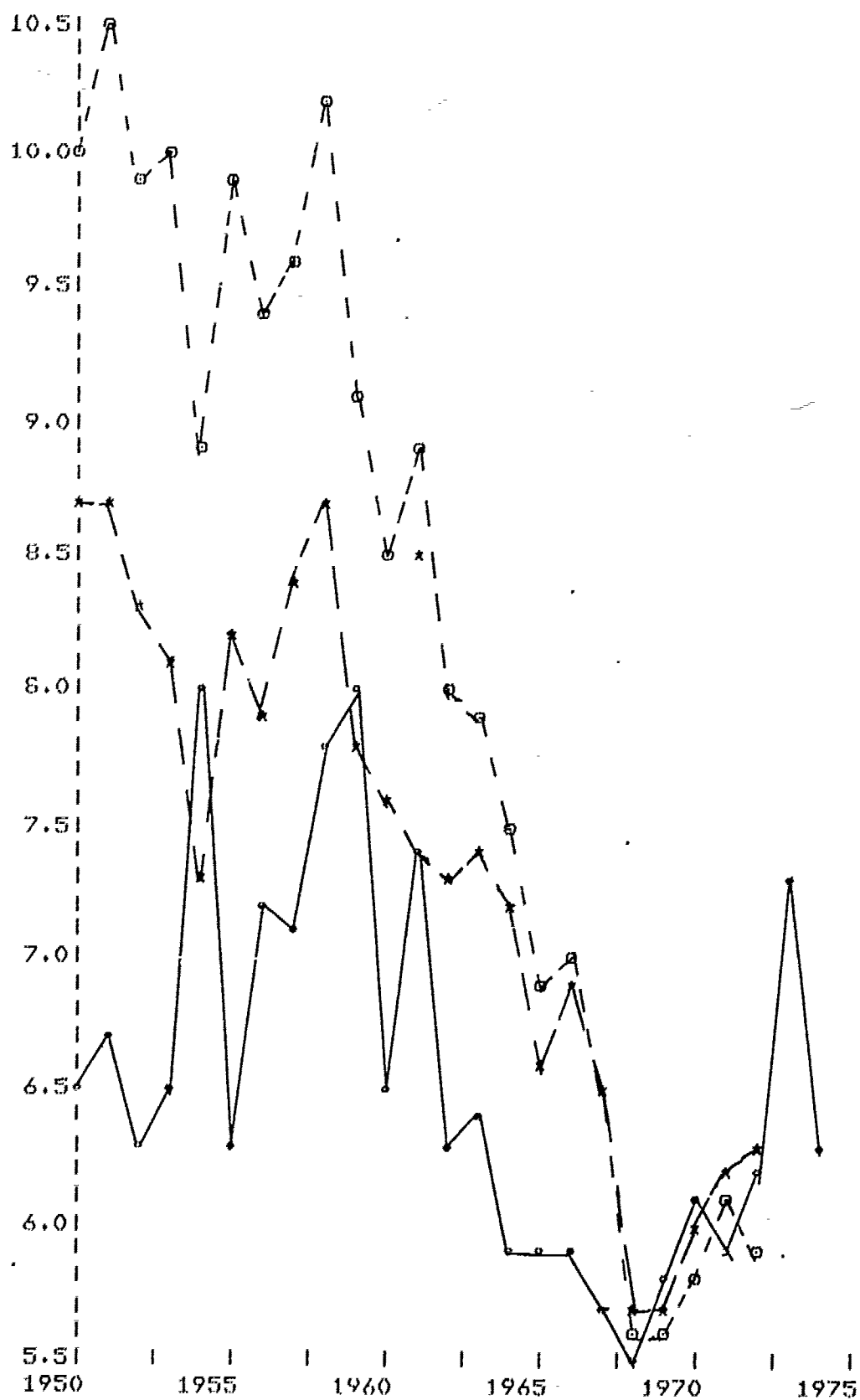


FIGURE 12



MEDIAN TIMES TO TENURE - 1973(---)1973 CORRECTED(---)1975(—)SURVEYS
PRIVATE UNIVERSITIES

private universities. It can be seen that the effect of this correction is to draw the 1973 and 1975 estimates much closer together. The difference between the corrected and the uncorrected 1973 estimates is largest for the years prior to 1964. This suggests, as we would expect, that the "error" caused by the "misreporting" of the first date of tenure is larger for the earlier cohorts, whose respondents are much more likely to have moved with tenure. After 1968 or 1969, the corrected estimates are very close to the uncorrected estimates.

We feel that this difference in the tenure question on the two questionnaires may account for some of the difference in our estimates of time to tenure from the two Surveys. However, there are other qualitative differences in the two samples which suggest that there may be non-random differences in the underlying population.

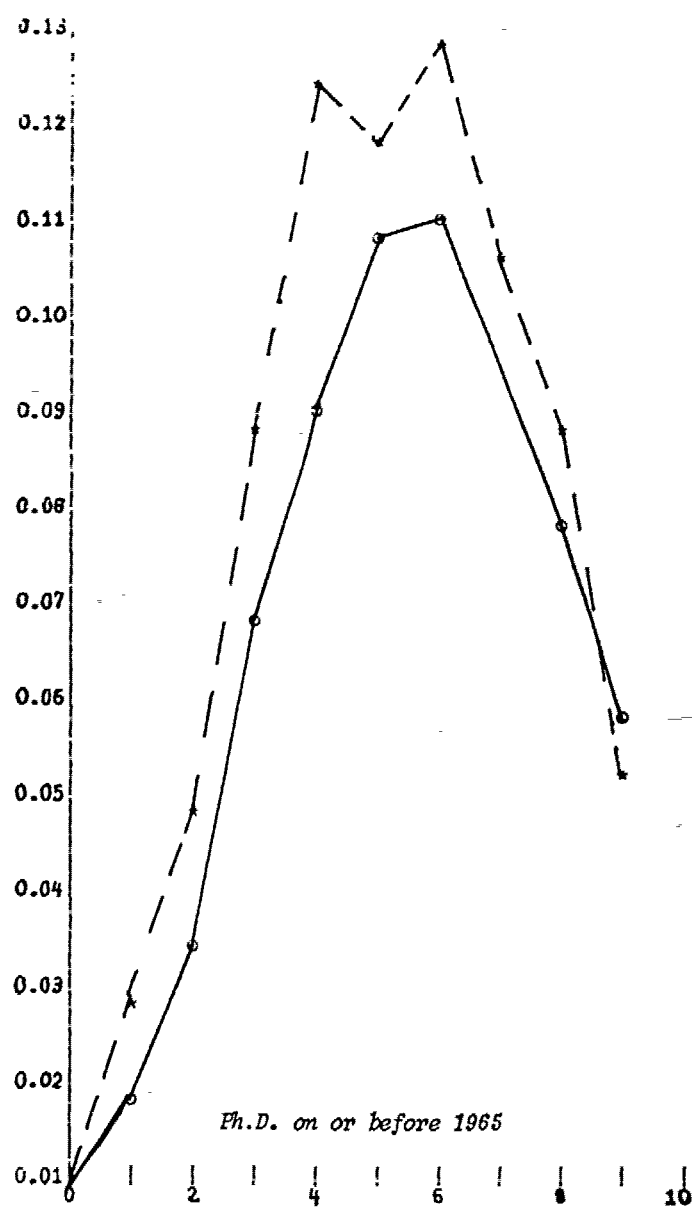
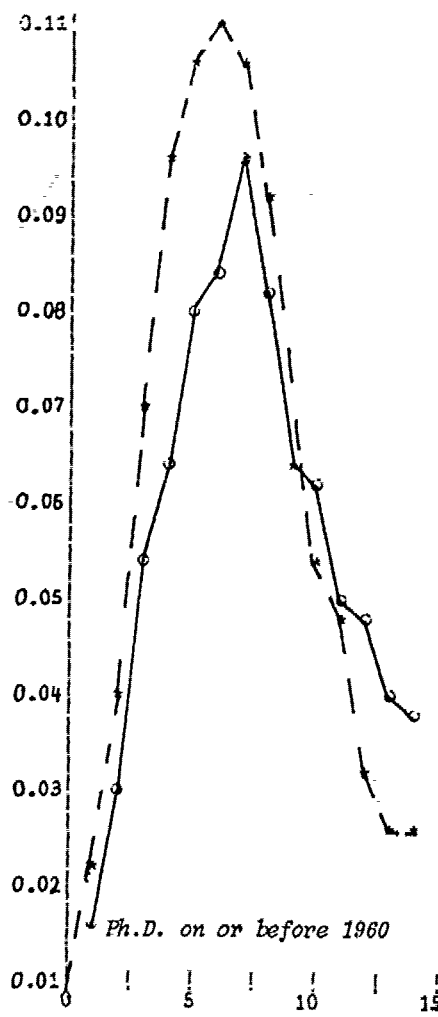
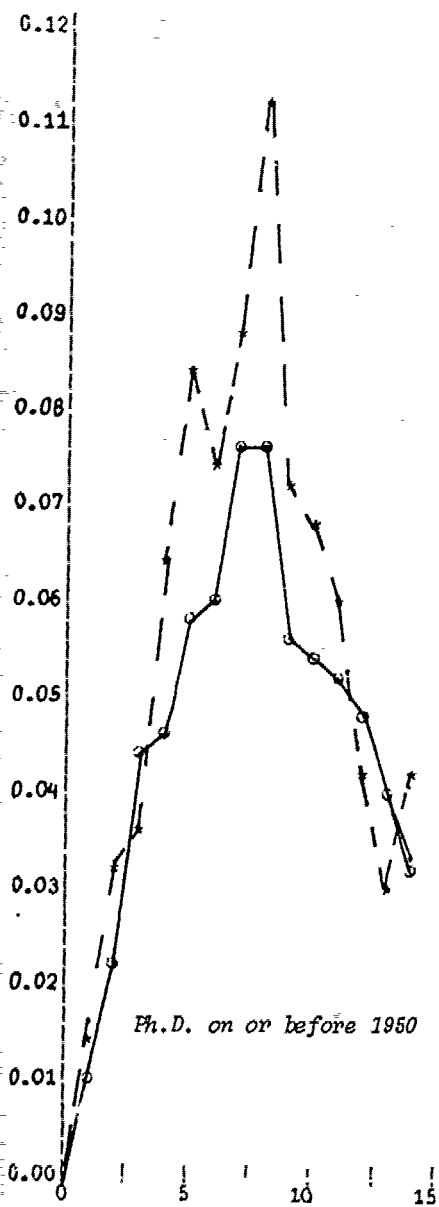
Another possible explanation of the differences in the estimates for the two samples is that the characteristics of the individuals in the underlying population for the two samples were, in fact, different. Selective attrition is a prime candidate for such a "selection" effect. A careful investigation of this possibility will have to await data from the NAS-NRC Comprehensive Roster of Doctoral Scientists and Engineers. An example of how the effect could change the estimates, however, would be the following: Suppose that older untenured people left academia between 1973 and 1975.^{3/} Then the remaining older population would be more likely to have tenure. Because of this selective attrition, the right-hand tail of the distribution of time to tenure would be shorter and the estimated median time to tenure

^{3/} Given the delay between the choice of the sample and the actual sampling, these dates are more appropriately 1971 and 1975.

would fall. This would mean that the age effects estimated from the 1975 Survey would be greater for all ages. The median times to tenure would look more similar to 1973 at the later dates because attrition from the older cohorts would have a smaller effect for these later years on the proportion of "successes".

To examine the question of selective attrition more closely, we compared the older Ph.D. cohorts in the two samples. That these older cohorts have a higher proportion of tenured people in 1975 than in 1973 is evident from the data in Table 10. We then asked whether, if we had sampled the 1975 population in these cohorts in 1973, we would have observed the same tenure rates as in the 1973 sample. The graphs in Figure 13, for three cohorts, show consistent differences. For all the older cohorts, a higher proportion of the 1975 sample was given tenure in all years up to the eighth after receiving the Ph.D. Chi-square tests for each cohort also indicate that we must reject the hypothesis that the two distributions of time to tenure could have come from the same population.

We have thus found that the two samples differ systematically with respect to the time to tenure for the earlier cohorts. Not only were these cohorts around in the 1960's when the time to tenure fell due to market conditions, but those in the 1975 survey were more likely to receive tenure at an earlier age, regardless of the date at which it was received. Had the older people who were less good left academia between the samples? Were early retirement programs working? Is there some other sampling anomaly that would result in this difference? In the absence of direct evidence on attrition, we don't know. If it were true, however, that attrition as well as the tenure rate behaves in a way that responds to market conditions, as we suspect, it would be an interesting finding



SAMPLE DENSITY OF TIME TO TENURE - PUBLIC UNIVERSITIES
1973 SAMPLE (—) AND 1975 SAMPLE (---)

FIGURE 13

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with the implication that the academic labor market, in fact, responds in numerous ways to the change from growth to the steady state.

Conclusions

In this technical report we used data from the 1975 Carnegie Survey of Teaching Faculty to investigate changes in tenure rates with the same method that we used to examine the 1973 ACE Survey. We have found that the model yields similar qualitative results for both sets of data. In particular:

1. For all types and control of institution, median times to tenure fell rapidly from 1961 until the late 1960's. Thereafter, they rise slowly through 1973 for universities and private colleges, and level off for public colleges.

2. The median time to tenure is longer in private than in public institutions.

3. The overall patterns described above are also found when the sample is disaggregated by broad field. As was found in the earlier report [2], the median time to tenure is longer in the physical and biological sciences than in the humanities and social sciences.

Quantitatively, however, the estimates from the two samples differ systematically. In particular, the estimates from the 1975 sample are more variable and are lower for the period up to 1968. We looked at differences between the two samples and found the following:

4. The 1975 sample is smaller than 1973. It is likely that this difference may account for the greater variability of the estimates.

5. Although there are differences between the two samples with respect to quality of institution, these differences do not appear to account for the systematic differences in tenure rates at the earlier dates that we observe.

6. The tenure question on the 1973 Survey was worded differently than on the 1975 Survey. If read correctly, it asks when the respondent received

tenure at his current institution. Fortunately, the majority of respondents misread the question and replied with the date when they were first given tenure. However, for those who answered that they received tenure at the same date as they began service at their present institution, but who may first have received tenure elsewhere, we have overestimated the time to tenure. Eliminating this questionable group markedly lowers the estimates of time to tenure in the 1973 Survey, particularly in the earlier years. The estimates, however, are still above the estimates from the 1975 Survey.

7. The time to tenure for the earlier Ph.D. cohorts in the 1975 sample is lower than for the same cohorts in the 1973 sample. This may be due to selective attrition which would result in older non-tenured faculty leaving academia during the years between the two samples. This sort of attrition could possibly have resulted from the increase in early retirement programs during the time between the two samples. Further examination of this question will require data from a sample that includes individuals both within and outside academia.

The most serious question raised by the quantitative differences in the estimates is their use for prediction of future adjustment of tenure in the academic labor market. My feeling is that, unless there is a sampling anomaly of which we are unaware, the academic population has changed between 1973 and 1975 with respect to tenure rates of older cohorts and that the 1975 estimates reflect this change. It is also true that a more complete model would treat attrition, if that is the cause, as endogenous. It is comforting, however, to note that in the later years of the period, the estimates from the two samples are much more similar at a time when both samples contain many more observations.

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2. Kuh, Charlotte and Radner, Roy. Market Conditions and Tenure in U.S. Higher Education: 1955-1973. Carnegie Council on Policy Studies in Higher Education Project on Quantitative Policy Analysis Models of Demand and Supply in Higher Education, Technical Report No. 2. Berkeley, California, April 1977.
3. Trow, Martin. Technical Report on Carnegie Council Surveys 1975, 1976, Berkeley, California, 1977. (Mimeographed.)

Table A1

LOGIT AGE EFFECTS
1975 SURVEY

AGE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1	0.024	0.017	0.052	0.043
2	0.045	0.032	0.054	0.039
3	0.100	0.062	0.141	0.075
4	0.175	0.109	0.223	0.108
5	0.213	0.151	0.253	0.201
6	0.307	0.253	0.278	0.246
7	0.297	0.230	0.217	0.267
8	0.337	0.221	0.216	0.250
9	0.239	0.219	0.232	0.231
10	0.256	0.278	0.250	0.211
11	0.247	0.213	0.290	0.199
12	0.222	0.174	0.233	0.137
13	0.192	0.183	0.134	0.124
14	0.224	0.163	0.226	0.177
15	0.154	0.316	0.223	0.154
16	0.169	0.210	0.261	0.131
17	0.327	0.301	0.186	0.212
18	0.229	0.134	0.118	0.111
19	0.139	0.099	0.243	0.118
20	0.222	0.123	0.080	0.097
21	0.089	0.254	0.264	0.040
22	0.164	0.160	0.063	0.142
23	0.103	0.226	0.148	0.210
24		0.086	0.190	
25	0.197		0.244	0.123
26	0.204	0.126	0.328	0.135
27		0.191		0.071
28		0.614	0.168	
29	0.239	0.892	0.193	0.141
30	0.090		0.254	0.276
31	0.096			0.105
32	0.376			
33				0.154
34			0.546	
35	0.188			0.216
36				
37				
38				
39			1.248	
40				
41				
42				
43				

Table A2

LOGIT DATE EFFECTS
1975 SURVEY

DATE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1927				
1928				
1929				
1930				
1931				
1932				
1933				
1934				
1935				
1936				
1937	0.527			
1938				
1939	0.246	0.843		0.447
1940		0.374	0.343	
1941	0.138			
1942	0.277	0.211	0.970	
1943	0.087	0.253	0.211	0.405
1944	0.035	0.207		
1945	0.183	0.228		
1946	0.483	0.616	0.259	0.194
1947	0.451	0.594	0.411	0.259
1948	0.601	1.185	0.435	0.233
1949	0.557	1.219	0.750	0.212
1950	0.816	1.019	1.274	0.408
1951	0.633	0.948	0.337	1.243
1952	0.902	1.079	0.503	0.499
1953	0.836	1.004	0.391	0.575
1954	0.751	0.662	0.577	0.620
1955	0.504	1.088	0.699	0.496
1956	0.845	0.809	0.650	0.835
1957	0.810	0.849	0.592	0.761
1958	1.192	0.698	0.651	1.048
1959	0.750	0.657	0.601	0.795
1960	0.805	1.018	0.716	0.593
1961	0.681	0.758	0.596	1.054
1962	0.895	1.091	0.441	0.486
1963	0.366	1.064	0.677	0.583
1964	1.118	1.260	0.841	0.811
1965	1.634	1.250	0.631	1.284
1966	0.888	1.307	0.858	1.322
1967	1.362	1.389	1.011	1.353
1968	1.666	1.563	0.967	1.393
1969	1.489	1.330	1.230	1.738
1970	1.482	1.194	1.472	1.577
1971	1.364	1.278	1.540	1.242
1972	1.466	1.119	1.578	0.994
1973	1.281	0.794	1.497	1.256
1974	1.315	1.101	1.938	1.103
				1.553

Table A3

MEDIAN AGES TO TENURE
1975 SURVEY

DATE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1927				
1928				
1929				
1930				
1931				
1932				
1933				
1934				
1935				
1936				
1937	7.405			
1938				
1939	9.959	7.078		8.494
1940		10.203	9.541	
1941	11.570			
1942	9.586	12.857	5.144	
1943	12.550	12.052	11.823	8.807
1944	13.559	12.939		
1945	10.831	12.524		10.974
1946	7.650	8.281	10.708	10.198
1947	7.841	8.435	8.744	10.508
1948	7.018	5.072	8.458	10.752
1949	7.245	5.994	5.886	8.779
1950	6.150	5.505	4.505	5.605
1951	6.871	6.717	9.724	8.121
1952	6.200	5.341	7.709	7.680
1953	6.079	5.544	8.935	7.450
1954	6.385	7.977	7.005	8.141
1955	7.005	6.317	6.144	6.591
1956	6.047	7.234	6.470	6.835
1957	6.169	7.053	5.892	5.991
1958	5.294	7.779	5.464	6.721
1959	6.392	8.007	6.828	7.589
1960	6.187	5.509	6.040	5.977
1961	6.664	7.427	6.850	8.216
1962	5.910	6.308	8.383	7.145
1963	5.743	5.382	6.289	6.668
1964	5.430	5.928	5.553	5.536
1965	4.539	5.944	6.607	5.473
1966	5.925	5.856	5.495	5.422
1967	5.015	5.737	5.026	5.358
1968	4.502	5.514	5.151	4.895
1969	4.828	5.821	4.580	5.089
1970	4.837	6.051	4.200	5.609
1971	5.011	5.900	4.105	6.130
1972	4.850	6.235	4.055	5.584
1973	5.143	7.303	4.154	5.874
1974	5.088	5.284	3.705	5.122
MED	5.66745	5.55992	5.05702	5.11490
IGR	4.45982	5.28504	5.12576	5.15203
RATIO	0.78858	0.80556	1.01359	0.84254

Table A4

COHORT SAMPLE SIZES
1975 SURVEY

DATE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1927				
1928				
1929			1	
1930		1		
1931		3		1
1932	5	1	1	
1933	4	1		2
1934	10	5		1
1935	8	6	3	3
1936	10	11	2	5
1937	15	13	5	5
1938	15	5	2	7
1939	20	11	6	9
1940	20	25	3	6
1941	19	15	10	9
1942	42	22	2	10
1943	22	14	4	10
1944	16	13		7
1945	8	6	2	5
1946	20	18	3	12
1947	37	19	8	11
1948	47	21	10	11
1949	61	44	18	13
1950	80	52	29	31
1951	84	46	27	30
1952	86	69	25	33
1953	89	44	36	38
1954	87	59	40	43
1955	90	55	35	42
1956	84	54	26	35
1957	92	58	35	46
1958	105	65	40	46
1959	95	55	28	46
1960	129	86	53	52
1961	127	74	57	55
1962	133	72	62	73
1963	169	88	74	65
1964	183	101	72	73
1965	203	108	69	80
1966	210	100	113	78
1967	203	90	95	98
1968	228	148	130	113
1969	247	127	179	115
1970	255	149	206	149
1971	241	137	154	139
1972	231	124	142	132
1973	197	124	135	141
1974	171	86	117	139
1975	24	19	17	33
TOTAL	4225	2445	2070	2059

Table A5

*RAW AGE-RELATED PROMOTION RATES
1975 SURVEY*

<i>AGE</i>	<i>PUBLIC UNIVERSITIES</i>	<i>PRIVATE UNIVERSITIES</i>	<i>PUBLIC COLLEGES</i>	<i>PRIVATE COLLEGES</i>
1	0.027	0.017	0.057	0.046
2	0.050	0.033	0.071	0.040
3	0.111	0.064	0.157	0.080
4	0.191	0.112	0.245	0.115
5	0.228	0.152	0.274	0.209
6	0.317	0.256	0.276	0.249
7	0.300	0.229	0.212	0.265
8	0.333	0.225	0.209	0.243
9	0.231	0.224	0.216	0.223
10	0.249	0.285	0.226	0.205
11	0.244	0.223	0.256	0.199
12	0.220	0.187	0.202	0.141
13	0.195	0.200	0.122	0.128
14	0.232	0.180	0.216	0.191
15	0.163	0.349	0.203	0.167
16	0.186	0.232	0.255	0.132
17	0.351	0.333	0.184	0.222
18	0.241	0.150	0.118	0.114
19	0.140	0.111	0.222	0.111
20	0.231	0.133	0.080	0.097
21	0.088	0.273	0.263	0.037
22	0.179	0.167	0.059	0.130
23	0.120	0.231	0.143	0.167
24		0.091	0.182	
25	0.211		0.222	0.125
26	0.214	0.143	0.285	0.143
27		0.200		0.077
28		0.567	0.167	
29	0.273	1.000	0.200	0.182
30	0.100		0.250	0.375
31	0.111			0.143
32	0.500			
33				0.167
34			0.500	
35	0.200			0.200
36				
37				
38				
39			1.000	
40				
41				
42				
43				

Table A6

RAW DATE-RELATED PROMOTION RATES
1975 SURVEY

DATE	PUBLIC UNIVERSITIES	PRIVATE UNIVERSITIES	PUBLIC COLLEGES	PRIVATE COLLEGES
1927				
1928				
1929				
1930				
1931				
1932				
1933				
1934				
1935				
1936				
1937	0.053			
1938				
1939	0.030	0.058		0.040
1940		0.038	0.050	
1941	0.019			
1942	0.042	0.022	0.138	
1943	0.013	0.027	0.033	0.054
1944	0.006	0.025		
1945	0.033	0.031		
1946	0.098	0.097	0.059	0.028
1947	0.090	0.092	0.088	0.041
1948	0.114	0.173	0.077	0.037
1949	0.091	0.165	0.114	0.033
1950	0.115	0.118	0.170	0.063
1951	0.078	0.090	0.043	0.174
1952	0.098	0.104	0.066	0.060
1953	0.105	0.089	0.054	0.066
1954	0.099	0.053	0.081	0.057
1955	0.086	0.114	0.100	0.052
1956	0.126	0.090	0.095	0.093
1957	0.124	0.099	0.095	0.089
1958	0.195	0.088	0.110	0.128
1959	0.116	0.083	0.101	0.099
1960	0.124	0.132	0.123	0.077
1961	0.103	0.095	0.097	0.137
1962	0.132	0.135	0.070	0.055
1963	0.139	0.131	0.105	0.089
1964	0.155	0.150	0.131	0.102
1965	0.212	0.144	0.101	0.155
1966	0.115	0.143	0.138	0.156
1967	0.173	0.152	0.153	0.158
1968	0.213	0.169	0.145	0.164
1969	0.185	0.139	0.180	0.199
1970	0.183	0.125	0.198	0.172
1971	0.157	0.131	0.195	0.135
1972	0.184	0.116	0.209	0.108
1973	0.168	0.088	0.216	0.134
1974	0.184	0.130	0.293	0.122
				0.176

Table A7

LOGIT AGE EFFECTS
 1975 SURVEY/PUBLIC UNIVERSITIES

AGE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1	0.006	0.046	0.032	0.005	0.025	0.022
2	0.016	0.061	0.051	0.037	0.057	0.077
3	0.051	0.200	0.120	0.053	0.104	0.187
4	0.132	0.266	0.221	0.103	0.214	0.316
5	0.156	0.389	0.225	0.159	0.383	0.439
6	0.294	0.400	0.518	0.349	0.347	0.292
7	0.147	0.367	0.473	0.351	0.436	0.465
8	0.269	0.236	0.422	0.420	0.395	0.357
9	0.197	0.112	0.382	0.445	0.353	0.109
10	0.471	0.280	0.378	0.246	0.138	0.236
11	0.266	0.231	0.347	0.390	0.456	
12	0.373	0.076	0.292	0.117	0.247	0.339
13	0.750	0.587	0.219	0.214	0.056	
14	0.326	0.507	0.372	0.276	0.281	0.149
15		0.242	0.151	0.134	0.666	
16	0.117	0.232	0.172	0.513		
17		1.194	0.199	0.418	0.459	0.892
18	0.415		0.306	0.336		
19	0.221				0.215	0.445
20	0.420			0.264	0.246	0.612
21		1.676	0.168			
22			0.220	2.507		
23						
24						
25	12.257		0.703			12.813
26			0.492		0.269	
27						
28						
29					0.424	
30		14.681				
31						
32			22.582		0.426	
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						

Table A8

LOGIT DATE EFFECTS
1975 SURVEY/PUBLIC UNIVERSITIES

DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1927						
1928						
1929						
1930						
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939				0.956		
1940						
1941					0.295	
1942						
1943					0.224	
1944		0.486				
1945	0.386	0.535	0.122	0.177		
1946	1.093		0.243	0.532	0.486	
1947	0.279	0.452		0.363	0.635	0.485
1948	0.609	0.586	0.434	0.785	0.585	1.661
1949	0.896	0.774	0.203	0.185	1.055	2.572
1950	0.998	0.971	0.699	1.108		
1951	0.608		0.113	1.201	0.681	
1952	0.812	0.499	0.792	0.878	0.546	1.599
1953	1.933		0.653	0.933	1.170	0.381
1954	0.768		0.855	1.251	1.110	0.879
1955	0.500	0.398	0.990	0.392	0.279	0.668
1956	0.378	0.695	0.460	1.441	0.486	0.281
1957	0.855	0.747	1.004	0.512	1.574	0.259
1958	1.056	1.387	0.770	1.295	0.966	0.955
1959	0.961	0.772	0.987	0.479	0.768	1.662
1960	0.805	0.628	0.941	0.783	0.640	
1961	1.031	0.828	0.582	0.859	0.340	1.037
1962	0.760	0.829	0.931	1.356	0.974	0.239
1963	1.856	0.284	0.916	0.940	1.123	0.605
1964	0.300	1.401	0.787	0.858	1.114	1.298
1965	1.278	1.633	1.741	1.598	1.548	1.844
1966	0.652	0.818	0.929	0.986	0.958	1.364
1967	1.755	1.117	1.284	0.821	1.690	1.420
1968	1.480	1.988	1.549	1.059	1.833	1.668
1969	1.613	1.269	1.946	2.184	0.681	1.142
1970	1.767	1.301	1.628	1.695	1.100	1.450
1971	0.824	1.175	1.558	1.276	2.056	1.181
1972	1.350	0.866	1.478	1.219	1.664	1.050
1973	1.430	1.197	1.235	0.889	0.864	0.645
1974	1.255	0.981	1.047	1.302	1.425	0.841

Table A9

MEDIAN AGES TO TENURE
1975 SURVEY/PUBLIC UNIVERSITIES

DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1927						
1928						
1929						
1930						
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939				6.286		
1940						
1941					7.823	
1942						
1943					8.483	
1944		6.446				
1945	10.250	6.087	17.837	10.838		
1946	6.312		10.044	7.654	6.635	
1947	11.913	6.724		8.611	6.021	6.394
1948	8.531	5.807	7.159	6.723	6.214	3.679
1949	7.135	5.070	11.420	10.745	4.892	3.139
1950	6.707	4.614	5.873	5.971		
1951	8.643		21.149	5.846	5.856	
1952	7.448	6.344	5.655	6.471	6.377	3.550
1953	5.182		5.997	6.337	4.737	7.154
1954	7.628		5.523	5.783	4.815	4.678
1955	9.372	7.388	5.281	8.422	7.942	5.334
1956	10.350	5.349	6.953	5.575	6.635	9.436
1957	7.284	5.151	5.257	7.745	4.815	11.050
1958	6.459	3.976	5.702	5.731	5.044	4.535
1959	5.877	5.077	5.286	7.901	5.576	3.678
1960	7.477	5.619	5.355	6.729	6.004	
1961	6.564	4.918	6.302	6.521	7.485	4.396
1962	7.651	4.916	5.382	5.663	5.025	11.529
1963	5.245	10.330	5.408	6.321	4.798	5.683
1964	11.577	3.959	5.654	6.524	4.811	4.024
1965	5.853	3.714	4.127	5.426	4.338	3.546
1966	8.266	4.943	5.386	6.216	5.054	3.948
1967	5.833	4.359	4.789	5.622	4.217	3.891
1968	5.606	3.420	4.374	6.051	4.103	3.674
1969	5.467	4.132	3.924	4.977	5.858	4.235
1970	5.323	4.088	4.269	5.343	4.829	3.862
1971	7.403	4.269	4.352	5.753	3.939	4.179
1972	5.758	4.831	4.476	5.823	4.238	4.375
1973	5.662	4.235	4.878	6.444	5.303	5.455
1974	5.884	4.594	5.188	5.723	4.455	4.754
MED	5.700	4.560	5.254	6.186	4.975	4.456
IQR	4.993	3.563	3.479	3.630	3.519	3.548
RATIO	0.745	0.803	0.661	0.587	0.707	0.796

Table A10

COHORT SAMPLE SIZES
1975 SURVEY/PUBLIC UNIVERSITIES

DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1927					2	
1928						
1929						
1930						
1931						
1932						
1933				2	2	
1934	1			1	1	
1935	2	1	1			
1936			1		1	
1937			2	3	1	
1938		2	2	3	1	
1939	3		3		3	
1940	2	2	6	5	2	1
1941		1	1	6	1	2
1942	5	1	2		4	
1943	3	2	8	5	7	1
1944	3		3	2	4	2
1945	2					
1946	1		1	3		1
1947	4	1	6		2	1
1948	3		4	7	4	
1949	3	1	10	5	2	3
1950	5		7	16	4	3
1951	12	3	10	12	16	3
1952	12	7	15	8	12	2
1953	6	3	12	11	10	4
1954	8	3	12	10	17	2
1955	9	5	10	7	10	
1956	7	8	9	11	6	4
1957	11	7	14	10	12	
1958	9	6	17	12	13	2
1959	9	8	14	7	10	3
1960	12	6	10	8	16	
1961	9	9	13	19	15	8
1962	10	9	21	20	17	5
1963	13	9	9	13	12	7
1964	13	11	28	13	17	10
1965	15	22	25	23	19	7
1966	14	18	27	15	22	15
1967	10	20	39	23	15	17
1968	13	24	26	23	28	12
1969	22	17	36	13	36	15
1970	21	10	45	22	31	11
1971	13	15	49	16	30	21
1972	13	15	39	18	32	24
1973	11	8	31	9	37	16
1974	13	12	37	6	33	12
1975	2	10	15	5	35	15
TOTAL	324	276	620	392	542	229

Table All

**RAW AGE-RELATED PROMOTION RATES
1975 SURVEY/PUBLIC UNIVERSITIES**

AGE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1	0.006	0.047	0.036	0.005	0.026	0.024
2	0.017	0.061	0.058	0.038	0.060	0.077
3	0.054	0.202	0.131	0.056	0.114	0.184
4	0.139	0.259	0.235	0.107	0.230	0.319
5	0.159	0.359	0.226	0.166	0.362	0.375
6	0.292	0.385	0.486	0.331	0.349	0.275
7	0.155	0.326	0.396	0.333	0.429	0.423
8	0.272	0.219	0.314	0.412	0.295	0.333
9	0.194	0.107	0.283	0.396	0.283	0.143
10	0.467	0.273	0.275	0.209	0.103	0.200
11	0.286	0.188	0.290	0.367	0.393	
12	0.417	0.067	0.240	0.111	0.217	0.250
13	0.750	0.500	0.190	0.182	0.045	
14	0.333	0.500	0.313	0.294	0.222	0.167
15		0.200	0.143	0.143	0.535	
16	0.143	0.250	0.167	0.556		
17		1.000	0.222	0.500	0.375	0.667
18	0.500		0.286	0.500		
19	0.333				0.143	0.500
20	0.500			0.333	0.167	1.000
21		1.000	0.167			
22			0.200	2.000		
23						
24						
25	20.000		0.667			20.000
26			0.500		0.250	
27						
28						
29					0.333	
30		20.000				
31						
32			40.000		0.500	
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						

Table A12

RAW DATE-RELATED PROMOTION RATES
1975 SURVEY/PUBLIC UNIVERSITIES

DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1927						
1928						
1929						
1930						
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939						
1940				0.125		
1941					0.077	
1942						
1943					0.043	
1944		0.125				
1945	0.050	0.143				
1946	0.167		0.036	0.040		
1947	0.048		0.074	0.120	0.125	
1948	0.091	0.143		0.087	0.152	0.143
1949	0.136	0.167	0.121	0.154	0.130	0.400
1950	0.125	0.167	0.049	0.033	0.250	0.333
1951	0.059	0.200	0.143	0.122		
1952	0.070		0.020	0.128	0.081	
1953	0.167	0.071	0.138	0.078	0.055	0.273
1954	0.087		0.111	0.107	0.143	0.071
1955	0.058		0.154	0.138	0.138	0.143
1956	0.054	0.087	0.172	0.065	0.046	0.167
1957	0.117	0.148	0.090	0.220	0.092	0.057
1958	0.131	0.133	0.191	0.078	0.305	0.071
1959	0.129	0.241	0.149	0.205	0.180	0.231
1960	0.104	0.156	0.173	0.077	0.145	0.333
1961	0.152	0.118	0.181	0.123	0.099	
1962	0.101	0.162	0.118	0.120	0.062	0.111
1963	0.224	0.150	0.169	0.173	0.167	0.045
1964	0.039	0.065	0.179	0.119	0.185	0.074
1965	0.150	0.239	0.140	0.115	0.181	0.194
1966	0.080	0.236	0.255	0.170	0.244	0.310
1967	0.212	0.123	0.131	0.124	0.143	0.158
1968	0.192	0.181	0.177	0.111	0.252	0.196
1969	0.176	0.280	0.210	0.139	0.258	0.208
1970	0.178	0.211	0.260	0.280	0.087	0.167
1971	0.084	0.246	0.211	0.195	0.152	0.275
1972	0.149	0.235	0.209	0.157	0.260	0.180
1973	0.193	0.186	0.201	0.154	0.240	0.164
1974	0.161	0.258	0.189	0.141	0.133	0.113
		0.213	0.175	0.207	0.222	0.165

Table A13

LOGIT AGE EFFECTS 1975 SURVEY/PRIVATE UNIVERSITIES						
AGE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1	0.009	0.010	0.036	0.003	0.011	0.020
2	0.037	0.035	0.066	0.013	0.031	0.022
3	0.037	0.076	0.067	0.048	0.073	0.058
4	0.053	0.117	0.175	0.072	0.186	0.217
5	0.117	0.136	0.208	0.140	0.239	0.124
6	0.147	0.273	0.380	0.254	0.448	0.201
7	0.218	0.279	0.434	0.277	0.357	0.466
8	0.218	0.274	0.207	0.304	0.372	0.249
9	0.181	0.216	0.254	0.183	0.295	0.165
10	0.209	0.615	0.475	0.329	0.301	0.220
11	0.202	0.283	0.187	0.431	0.264	0.073
12	0.136	0.606	0.256	0.068	0.140	0.129
13	0.192	0.060	0.213	0.316	0.164	0.273
14	0.169		0.147	0.282	0.200	
15	0.466	0.594	0.457	0.621	0.274	0.292
16		0.234	0.355	0.440	0.153	
17	0.142		0.547		0.595	
18	0.151	0.430	0.252			0.890
19	0.501	2.089				
20			0.534	0.277		
21		18.116		1.012		
22						
23	0.400					
24						
25						
26	0.889					
27					1.017	
28			0.874		12.339	
29				15.294		
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						

Table A14

LOGIT DATE EFFECTS
1975 SURVEY/PRIVATE UNIVERSITIES

DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1927						
1928						
1929						
1930						
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939	47.142		0.792		4.098	32.137
1940						
1941						
1942						
1943						
1944				1.005		
1945					0.473	
1946	0.754	0.567	0.255	0.622		
1947	0.593		0.219	0.571		
1948	0.588	1.053	0.410		0.327	
1949	0.619	4.836	0.179	1.751	2.082	
1950		2.476	2.700	0.254	2.309	1.608
1951		2.674	0.697	0.714	1.824	
1952	1.065	1.033	0.472	1.672	3.051	1.336
1953	1.346	3.116	1.301	0.615	0.639	1.723
1954			0.411	0.735	0.393	3.772
1955			0.860	0.719	1.051	0.877
1956	1.177	0.517	1.174	0.471	0.771	0.536
1957	0.435	0.413	0.903	1.122	0.420	1.429
1958	1.508	0.270	0.957	1.063	0.199	1.292
1959	1.200	0.511	0.356	0.977	1.314	0.459
1960	0.552	0.835	0.831	0.470	0.761	0.486
1961	1.068	0.369	1.015	1.088	1.244	0.554
1962	1.088	0.414	0.659	0.958	0.865	
1963	1.840	0.519	1.007	0.969	0.930	2.465
1964	0.581	0.877	1.552	0.559	1.343	
1965	1.517	0.901	1.185	1.912	0.790	2.827
1966	1.648	0.750	2.001	0.958	0.770	1.911
1967	1.743	1.467	1.299	1.218	1.227	0.538
1968	1.073	1.332	2.160	1.632	1.391	0.939
1969	0.581	1.781	2.636	2.113	1.797	0.254
1970	1.161	2.271	1.595	1.383	1.783	2.011
1971	1.137	1.536	1.435	1.760	1.137	0.260
1972	1.555	0.547	1.554	1.763	1.437	0.753
1973	1.183	1.443	0.833	1.467	1.452	0.997
1974	0.250	1.329	1.096	0.254	0.242	0.979
	1.079	2.028	0.725	0.842	1.085	1.826

Table A15

MEDIAN AGES TO TENURE
1975 SURVEY/PRIVATE UNIVERSITIES

DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1927						
1928						
1929						
1930						
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939	1.443		5.020		3.542	
1940						1.445
1941						
1942						
1943				5.833		
1944					7.475	
1945			9.355	8.405		
1946	8.359	8.419	9.625	8.910		
1947	9.311		7.893		9.253	
1948	9.281	6.278	9.935	5.710	4.390	
1949	9.101	3.439	3.759	13.545	4.231	
1950		4.576	6.298	7.792	4.600	5.119
1951		4.417	7.251	5.782	3.851	5.531
1952	7.295	6.331	5.118	8.470	6.542	4.955
1953	5.707	4.110	7.877	7.699	8.270	3.599
1954			5.852	7.769	5.495	6.284
1955	7.010	8.937	5.302	9.708	6.016	6.842
1956	10.293	9.558	5.773	6.579	7.950	5.382
1957	6.318	11.399	5.648	6.704	13.820	5.505
1958	6.964	9.000	8.449	5.901	5.146	6.970
1959	9.495	6.902	5.927	9.722	5.053	6.936
1960	7.286	9.860	5.552	6.650	5.231	6.808
1961	7.235	9.551	6.417	6.946	5.813	
1962	6.026	8.915	5.575	6.919	5.592	4.034
1963	9.321	6.756	4.767	8.056	5.111	
1964	6.444	6.692	5.285	5.577	5.957	3.871
1965	6.255	7.253	4.253	5.948	6.021	4.680
1966	6.144	5.579	5.121	5.398	5.252	6.837
1967	7.275	5.757	4.115	5.820	5.057	6.195
1968	9.321	5.235	3.794	5.430	4.624	7.350
1969	7.050	4.759	4.710	6.113	4.637	4.547
1970	7.109	5.497	4.931	5.702	5.371	7.877
1971	6.256	8.620	4.754	5.700	5.006	6.471
1972	6.997	5.610	5.923	5.994	4.975	6.115
1973	12.196	5.761	5.424	13.527	11.496	6.140
1974	7.260	5.007	6.213	7.307	5.445	4.799
MED	7.474	6.414	5.588	6.845	5.574	6.111
IQR	6.240	4.785	4.220	4.675	3.663	5.212
RATIO	0.835	0.746	0.755	0.683	0.657	0.853

Table A16

COHORT SAMPLE SIZES
1975 SURVEY/PRIVATE UNIVERSITIES

DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1927						
1928						
1929						
1930						
1931						
1932			1			
1933						
1934			1			
1935			2			
1936			1	1	1	
1937		2	1	3		1
1938	1		3	2	1	
1939	1	1	1	1	2	
1940	1		2		1	
1941	5	1	1	3	2	
1942	1	1	3	6	1	
1943	3	1	4	1	3	
1944	1	1	1	5	1	1
1945		2	2	3		
1946	1			1	1	
1947	1	1	2	1		1
1948			4	4	2	2
1949	1	2	2	3	3	
1950	1	4	8		1	4
1951	4	3	13	8	5	2
1952	1	3	4	10	5	3
1953	5	4	11	6	4	2
1954	5	5	4	11	8	2
1955	3	5	12	8	3	2
1956	5	4	8	11	7	2
1957	3	3	9	7	2	4
1958	9	8	5	13	7	
1959	5	4	8	5	9	
1960	8	4	8	10	6	2
1961	10	8	11	5	8	
1962	5	5	11	10	13	1
1963	5	8	9	16	9	3
1964	9	10	12	11	6	3
1965	4	11	14	14	11	4
1966	5	10	13	9	20	5
1967	8	7	9	14	17	5
1968	9	2	9	7	17	5
1969	15	11	21	19	14	4
1970	12	12	21	16	27	4
1971	13	10	21	19	17	4
1972	13	6	26	13	27	4
1973	7	9	28	18	15	4
1974	5	7	25	8	16	11
1975	1	11	12	6	21	6
				2	17	4
TOTAL	188	186	352	310	330	95

Table A17

RAW AGE-RELATED PROMOTION RATES 1975 SURVEY/PRIVATE UNIVERSITIES						
AGE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1	0.011	0.012	0.039	0.003	0.013	0.022
2	0.040	0.037	0.072	0.013	0.036	0.024
3	0.037	0.078	0.069	0.051	0.078	0.076
4	0.058	0.134	0.177	0.075	0.199	0.216
5	0.115	0.146	0.215	0.140	0.226	0.143
6	0.144	0.294	0.354	0.250	0.437	0.182
7	0.219	0.260	0.403	0.259	0.333	0.409
8	0.204	0.250	0.200	0.315	0.358	0.235
9	0.184	0.219	0.220	0.186	0.308	0.143
10	0.188	0.600	0.444	0.295	0.316	0.273
11	0.200	0.250	0.174	0.467	0.286	0.100
12	0.158	0.600	0.222	0.074	0.157	0.143
13	0.188	0.125	0.200	0.300	0.200	0.200
14	0.143		0.167	0.357	0.250	
15	0.500	0.750	0.500	0.750	0.333	0.333
16		0.333	0.333	0.600	0.200	
17	0.143		0.500		0.667	
18	0.167	0.500	0.333			0.500
19	0.500	1.000				
20			0.500	0.250		
21		20.000		0.500		
22						
23	0.333					
24						
25						
26	1.000					
27					1.000	
28			1.000		20.000	
29				20.000		
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						

Table A18

RAW DATE-RELATED PROMOTION RATES
1975 SURVEY/PRIVATE UNIVERSITIES

DATE	BIOLOGICAL SCIENCES	ENGINEERING	HUMANITIES	PHYSICAL SCIENCES	SOCIAL SCIENCES	EDUCATION
1927						
1928						
1929						
1930						
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939	1.000		0.111		0.250	
1940						20.000
1941						
1942						
1943						
1944				0.100		
1945					0.100	
1946	0.083	0.125	0.048	0.091		
1947	0.083		0.050	0.095		
1948	0.091		0.100		0.083	
1949	0.091	0.286	0.043	0.273	0.354	
1950		0.500	0.563	0.048	0.333	0.143
1951		0.250	0.091	0.115	0.167	
1952	0.133	0.222	0.061	0.125	0.214	0.091
1953	0.111	0.091	0.156	0.056	0.059	0.182
1954		0.250	0.049	0.068	0.042	0.300
1955	0.130		0.125	0.061	0.125	0.091
1956	0.036	0.048	0.156	0.053	0.107	0.083
1957	0.148	0.042	0.152	0.123	0.071	0.143
1958	0.091	0.038	0.146	0.111	0.029	0.167
1959	0.056	0.063	0.060	0.115	0.194	0.091
1960	0.100	0.125	0.160	0.060	0.105	0.083
1961	0.087	0.059	0.184	0.161	0.179	0.091
1962	0.159	0.077	0.111	0.125	0.106	
1963	0.065	0.073	0.151	0.111	0.120	0.364
1964	0.146	0.167	0.226	0.107	0.191	
1965	0.182	0.130	0.182	0.219	0.115	0.200
1966	0.167	0.095	0.278	0.108	0.108	0.176
1967	0.111	0.170	0.175	0.143	0.155	0.048
1968	0.059	0.176	0.294	0.217	0.173	0.083
1969	0.098	0.233	0.341	0.222	0.219	0.037
1970	0.090	0.256	0.204	0.128	0.205	0.240
1971	0.127	0.170	0.172	0.141	0.136	0.036
1972	0.091	0.075	0.164	0.140	0.162	0.103
1973	0.024	0.160	0.088	0.130	0.188	0.138
1974	0.115	0.157	0.123	0.031	0.037	0.111
		0.261	0.092	0.120	0.183	0.157